HALACARIDAE FROM THE GREAT BARRIER REEF LAGOON AND CORAL SEA: *HALACARELLUS* AND *HALACARUS* (ACARINA: HALACAROIDEA)

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The marine mites *Halacarellus* and *Halacarus* are recorded for the first time from northeastern Australia. *Halacarellus katewilsonae* sp. nov. and seven new species of *Halacarus*, namely *chilcottensis*, *heraldensis*, *juliani*, *sabulonis*, *rarus*, *striolus* and *tritoni* are described. *Halacarus rarus* belongs to the *ctenopus* group, *H. tritoni* to the *actenos* group and the other five new *Halacarus* species to a newly proposed *membraneus* group. *Halacarus discophorus* Bartsch, a species previously described from southwestern Australia, is recorded from northwestern and northeastern parts of the continent. A key to Australian species of *Halacarus* and *Halacarellus* is presented. ❐ *Halacarids, Halacarellus, Halacarus, Great Barrier Reef, Australia, Coral Sea, Queensland Plateau.*

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This paper is one in a series describing mites in the predominantly marine Halacaridae, that were found during a survey on the Great Barrier Reef and reefs in the Coral Sea. Bartsch (2000), Otto (1999a-c, 2000a-i) and Otto & Bartsch (2000) dealt with 19 genera and this paper deseribes species of *Halacarellus* and *Halacarus*.

Halacarellus lubricus Bartsch and *Halacarus oblongus* Lohmann are known from SE Australia (Lohmann, 1893; Otto, 1994), and 12 species occur in SW Australia (Bartsch, 1993a, 1999a). This paper provides first records of *Halacarellus* and *Halacarus* from tropical Australia.

METHODS

All material was collected by the author exeept where stated otherwise. Mites were eleared in lactic acid and mounted in PVA. Drawings were made with the aid of a eamera lucida. In the figure legends, letters enclosed by parentheses refer to illustrations that do not have scale bars but are drawn to the same magnification as those referred to by the letter that precedes the parentheses. In the accounts of each species only one sex is deseribed in detail; for the opposite sex only characters that differ are described. Measurements or counts given as ranges are based on all available material. In the accounts of leg chaetotaxy, numbers enclosed in parentheses refer to rare setal complements. Abbreviations in descriptions: AD, anterior dorsal plate; AE, anterior epimeral plate; glp-1 to glp-5, dorsal gland pores numbered from anterior to posterior; ds-1 to ds-6, dorsal idiosomal setae (excluding those on posterior epimeral plate) numbered in sequenee from anterior to posterior; GA, genitoanal plate; GO, genital opening; OC, ocular plate; pas, parambulacral seta(e); pgs, perigenital seta(e); PD, posterior dorsal plate; PE, posterior epimeral plate; P-1 to P-4, palp segments numbered in sequenee from base of palp; sgs, subgenital seta(e); leg I to leg IV. Specimens with the registration number prefix QMS are deposited in the Queensland Museum. Other depositories for type or non-type material are: AIMS, Australian Institute of Marine Seience, Townsville; ANIC, Australian National Insect Collection, Canberra; ZMH, Zoologisches Museum der Universität Hamburg, Germany.

SYSTEMATICS

Superfamily HALACAROIDEA Cunliffe, 1955
Family HALACARIDAE Murray, 1877
Halacarellus Viets, 1927

Halacarellus Viets, 1927: 120. Bartsch, 1997: 1223; 1998: 150.

Thalassarachna Packard, 1871, sensu Newell, 1945: 59 (in part; see Bartsch, 1997). Newell, 1984: 89. Green & Macquitty 1987: 116. Otto, 1994: 40.

TYPE SPECIES. *Halacarus balticus* Lohmann, 1889, by original designation.

DIAGNOSIS. Idiosoma with AD, OC and PD, 6 pairs of dorsal idiosomatic setae and up to 5 pairs of gland pores. No setae within ventral membranous cuticle. Palps 4-segmented. P-2 with 1 seta. P-3 with a medial spur or seta. P-4 with 3 setae in basal whorl. Genua shorter than telofemora and tibiae. All tarsi with 3 dorsal setae. Tarsus I with several eupathidia apically and 1 non-eupathid ventromedial seta (only exceeption with 2 such setae: *H. procerus*). Solenidion on tarsus I dorsolateral, on tarsus II dorsomedial.

REMARKS. Newell (1945, 1984), Green & MacQuitty (1987) and Otto (1994) regarded *Halacarellus* as a junior synonym of *Thalassarachna* Packard, following Newell's (1945) argument that their type species (*H. balticus* and *T. verrillii*) are congeners. However, Bartsch (1972, 1990) rejected Newell's proposal on the basis that *T. verilli* is insufficiently known and its affinities with *Halacarellus* not well proven. As a result, *Thalassarachna* and *Halacarellus* were used in parallel for the same genus over several decades. Bartsch (1997) argued that *Halacarellus* sensu Viets (= *Thalassarachna* sensu Newell) consists of 2 subgroups, one containing the *Halacarellus* type, *Halacarus balticus*, and the other with the *Thalassarachna* type, *T. verrillii* (= *Acarus basteri* Johnston). Hence, *Halacarellus* sensu Viets was split into *Halacarellus* s. str. and *Thalassarachna* s. str. as used herein.

Halacarellus katewilsonae sp. nov.
(Figs 1,2)

ETYMOLOGY. For Kate Wilson, for her continuous support.

MATERIAL. HOLOTYPE: QMS105569, 1 ♂, Queensland Plateau, Chilcott Islet, 16°56.611'S 150°0.177'E, 14 Sep. 1998, coarse sand at 0.5m. PARATYPES: Queensland Plateau: QMS105570-105573, 4 ♂, QMS105574-105577, 4 ♀, ZMH, 1 ♂, ANIC, 1 ♂, data as for holotype; QMS105578/105579, 2 ♂, South Willis Islet, ca. 16°18'S 149°58'E, 15 Sep. 1998, coral rubble at 0-10m; QMS105580, 1 ♂, Herald Cays, 16°57.171'S 149°12.036'E, coarse sand at 5-15m.

DESCRIPTION. *Male*. Idiosoma 394-444µm long (holotype 441µm). All idiosomal plates finely punctate; other ornamentation absent, except for a series of pits on AD, OC and PD (Fig. 1A). AD longer than wide; truncated or rounded posteriorly; with glp-1 and pair of ds-1. Setae ds-2, ds-3 and ds-4 inserted in finely striated membranous cuticle. OC similar in length to AD; at least 3 times longer than wide and slightly curved; two pores, one anteriorly, the other posteriorly; pore canaliculus near posterior margin. PD shorter than half of idiosoma; strongly convex anteriorly; pair of ds-5 in anterior half, pair of glp-4 posteriorly. Ventrally with pair of oblong subcuticular sclerites between AE and PE (Fig. 1B). PE with one dorsal and 3 ventral setae. GA with ca. 24-32 pgs surrounding GO, one pair slightly offset anteriorly (Fig. 1C); 4 pairs of sgs seen, the 3 posterior pairs more difficult to discern than the anterior pair. Posterolaterally to GO a pair of lyrifissures.

Gnathosomal base slightly wider than long and about as long as rostrum (Fig. 1E); one pair of maxillary setae inserted at level of palp insertions, the other more delicate pair in anterior half of rostrum; two pairs of rostral setae near tip of rostrum. Pharyngeal plate with 4 pairs of panels. Segment P-3 with spur.

Lateral flanks of legs finely punctate, more conspicuously on telofemora than on other segments. Chaetotaxy (trochanter-tibia): I 1-2-4-5 -13 (Fig. 2A), II 1-2-5-5-9 (Fig. 2D), III 2-3-3 -3-6 (Fig. 2E), IV 0-3-3-3-6 (Fig. 2F). Ventral setae on tibia I slightly thickened basally but not distinctly spiniform. Tibia II with 2 and tibiae III and IV each with 3 bipectinate setae; those on tibia IV shorter, less conspicuously pectinate than others. Telofemur IV with short dorsal spine. Tarsus I with 3 dorsal setae, solenidion, ventromedial seta and 7-9 pairs of eupathid pas (Fig. 2B,C). Tarsus II with 3 dorsal setae (distomedial 1 closer to most proximal than to distolateral 1), solenidion, 1 ventral seta, and pair of doubled pas. Tarsi III and IV with 3 dorsal setae (both distal ones at similar distance from proximal margin of segment) and pair of pas-singlets. Paired claws of tarsus I with barely visible pecten, those on other tarsi much more distinctly pectinate. All paired claws with accessory process.

Female. Idiosoma 386-459µm long. GA with 3 pairs pgs, but no sgs (Fig. 1D).

REMARKS. Other *Halacarellus* that have an elongate OC with one gland pore anteriorly and one posteriorly, a pair of maxillary setae in distal third of rostrum and the other pair level with the palp insertions, 3 ventral setae on tibiae III and IV, and 2, 2, 3 and 3 setae on basifemora I-IV, respectively, are those in the *H. harioti* group (Bartsch, 1997,1999a), *harioti* (Trouessart, 1889), *kerguelensis* (Lohmann, 1907), *lubricus* Bartsch, 1985, *porellus* Bartsch & Pugh, 1994 and *rottnestensis* Bartsch, 1999a. *H. katewilsonae* differs from these by the OC being distinctly more elongate and by the dorsal plates lacking costae, areolae or reticulation.

An OC similar in shape to that of *H. katewilsonae* occurs in *Peregrinacarus reticulatus* Bartsch, a species closely related to *Halacarellus* (Bartsch, 1999b). *Halacarellus* differs from *Peregrinacarus* by its medioventral seta on tarsus I.

Of 46 known species of *Halacarellus* (Bartsch, 1997, 1998, 1999a), *H. katewilsonae* becomes the third tropical one, with *H. vajetus* from Tanzania (Bartsch, 1974) and *H. tropicalis* from Venezuela (Bartsch, 1984).

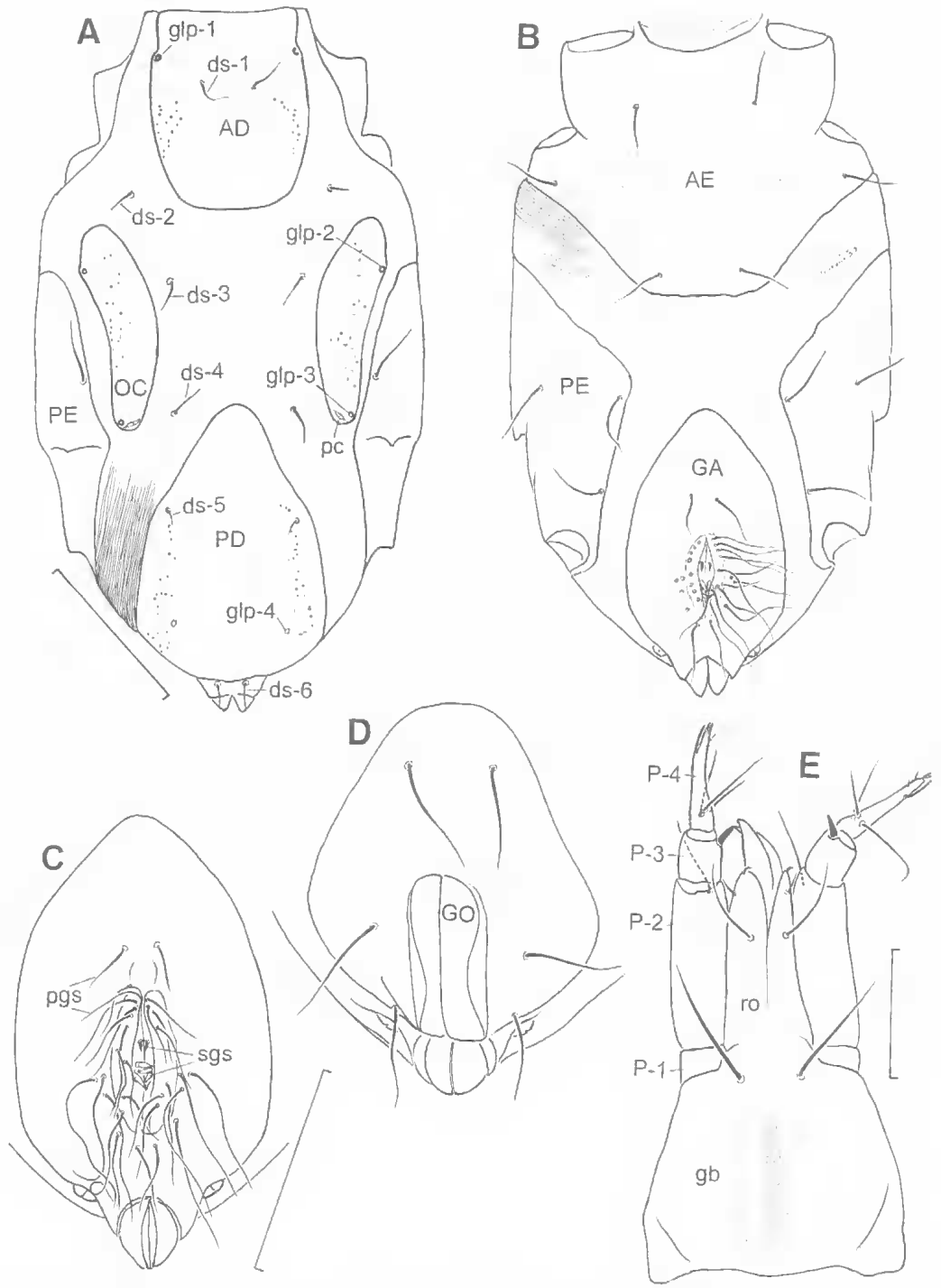

FIG. 1. *Halacarellus katewilsonae* sp. nov., adult. A, ♂, idiosoma, dorsal view; B, ♂, idiosoma, ventral view; C, ♂, genitoanal plate; D, ♀, genitoanal plate; E, ♂, gnathosoma, ventral view; AD, anterior dorsal plate; AE, anterior epimeral plate; ds-1 to ds-6, dorsal setae; GA, genitoanal plate; gb, gnathosomal base; glp-1 to glp-4, gland pores; GO, genital opening; PD, posterior dorsal plate; PE, posterior epimeral plate; pc, pore canaliculus; pgs, perigenital setae; sgs, subgenital setae. P-1 to P-4, palp segments; ro, rostrum. Scale bars: A (B) = 100μm; C (D), E = 50μm.

FIG. 2. *Halacarellus katewilsonae* sp. nov., adult. A, ♂, leg I, dorsolateral view; B, ♂, tarsus I, ventromedial view; C, ♂, tarsus I, lateral view (medial eupathidia omitted); D, ♂, leg II, lateral view; E, ♂, leg III, lateral view; F, ♀, leg IV, ventral view. bf, basifemur; ds, dorsal setae on tarsus; ge, genu; mcl, median claw; pas, parambulacral setae; pcl, paired claws; ta, tarsus; ti, tibia; tr, trochanter; vs, ventral seta on tarsus; w, solenidion. Scale bars: B (C) = 25μm; A (D, E, F) = 100μm.

Halacarus Gosse, 1855

Halacarus Gosse, 1855: 27. Bartsch, 1983: 181; 1993a: 46; 1993c: 22. Green & MacQuitty, 1987: 110. Newell, 1984: 37.

TYPE SPECIES. *Halacarus ctenopus* Gosse, 1855; by monotypy.

DIAGNOSIS. AD often with frontal spine. OC and PD present or absent. PD, if present, in ♂♂ often larger than in ♀♀. Most species with 5 pairs of distinct gland pores. Posteriormost dorsal seta (ds-6) inserted close to posterior pair of gland pores (glp-5). Both pairs of maxillary

setae on rostrum. Palps inserted laterally; P-2 with 2 setae, P-3 with medial spine; P-4 with 3 basal setae. Leg I stronger than other legs, with smooth or apically pectinate spines on tibia, genu and telofemur. Genu almost as long as telofemur or tibia. Solenidion dorsolateral on tarsus I, dorsomedial on tarsus II. Tarsus I with setiform famulus.

Halacarus chilcottensis sp. nov.
(Figs 3-5)

ETYMOLOGY. From Chilcott Islet.

MATERIAL. HOLOTYPE: QMS105619, ♂, Queensland Plateau, Chilcott Islet, 16°56.51'S 150°0.4E', 14 Sep. 1998, G.A. Diaz-Pulido, coarse sand at 10-15m. PARATYPE: QMS105620, 1 ♂, ZMH, 1 ♂, data as for holotype.

DESCRIPTION. *Male.* Idiosoma 599-604μm long (holotype 599μm). Dorsal plates covered by striated epicuticle (Fig. 4F). Membranous cuticle between plates as in Fig. 4G. AD drawn out anteriorly into a stout frontal spine (Fig. 3A); with pair of glp-1 and pair of ds-1. Setae ds-2, ds-3 and ds-4 in membranous cuticle. Pores glp-2 (Fig. 3B), glp-3 and glp-4 on platelets in membranous cuticle (Fig. 3A). OC separated from glp-3; variable in shape between and within specimens (Fig. 4A-C); lacking cornea but with pore canaliculus laterally. Posterior to glp-3 pair of plates that vary in shape. Setae ds-5 inserted on PD (Fig. 3D), except for one side in one specimen where it inserts in membranous cuticle (Fig. 3A). PD with variable and uneven anterior margin (Fig. 3D); posterior half with a series of minute pits underneath epicuticle; glp-5 situated on posterior swellings. Three pairs of setae on AE, 4 setae on PE, no setae in membranous ventral cuticle (Fig. 3C). Epicuticle on AE with fingerprint-like striation pattern (Fig. 4H). GA with two pairs of outlying pgs and ca. 29 pgs closely surrounding GO. Sgs not clearly seen.

Rostrum about as long as gnathosomal base; with one pair of maxillary setae in proximal half, the other pair in distal half (Fig. 4E). Palp transversely striated; both setae on P-2 inserted distally; P-3 with tapering but apically blunt spine (Fig. 4D).

All leg segments finely striated (Fig. 5B). Leg chaetotaxy (trochanter - tibia): I 1-2-7-8-15 (Fig. 5A), II 1-3-7-8-12 (11,13) (Fig. 5D), III 2-3(2)-5-6-9 (Fig. 5F), IV 1-2-4-6-10 (Fig. 5H). Telofemur and genu I with two, tibia I with 4 heavy ventral or ventromedial spines; less heavy spines on most other leg segments, including one dorsally on all basifemora, a set of usually 3, sometimes 4 (Fig. 5D), dorsally on tibia II, two dorsally on genu II, and two dorsally on telofemur II. Tarsus I with 3 dorsal setae, two pairs of ventral setae (the distal ones eupathidia), and pair of doubled pas; solenidion and famulus closely associated and of similar length and thickness (Fig. 5C). Tarsus II with 3 dorsal setae, pair of ventral setae, pair of doubled pas and solenidion (Fig. 5E). Tarsus III with 4 dorsal setae, one doubled pas, one pas singlet, and pair of ventral setae (Fig. 5G). Tarsus IV with 3 dorsal setae, pair of ventral setae, and pair of plumose pas singlets (Fig. 5I). Paired claws of legs I and IV smooth, of tarsi II and III with conspicuous pecten. Empodial claws not seen.

Female. Unknown.

REMARKS. *H. chilcottensis* belongs to the *membraneus* group. Members of this group have well-developed OC and PD, a pair of platelets immediately posterior to the OC, finely reticulated epicuticle on all plates, AD developed into a short, robust spine, 4 spines on telofemur I. Other species in group are *H. membraneus* Bartsch, 1981, and 4 new species (*heraldensis*, *sabulonis*, *juliani* and *striolus*). *H. chilcottensis* differs from these, among other characters, in its 3 or 4 spines dorsally on tibia II. In other species the dorsal setae on that segment are not distinctly spine-like or thickened.

A species closely related to the *membraneus* group is *Halacarus parmatus* Bartsch, 1993c, from Antarctica. It too has platelets posterior to the ocular plate and a similar AD. However, it is not included here as it differs, amongst other characters, in having 1 seta inserted proximally on P-2, and only 2 spines on telofemur I.

Halacarus discophorus Bartsch, 1993a
(Fig. 6)

MATERIAL. GBR Marine Park: QMS105581-105610, 11 ♀, 19 ♂, ANIC, 1 ♀, 1 ♂, AIMS, 15 ♂, 7 ♀, ZMH A83/00, 1 ♂, 1 ♀, Pandora Reef, 18°49'S 146°26'E, Elizabeth Reef, 19°20.12'S 149°02.85'E, Faraday Reef, 18°25.93'S 147°21.11'E, Myrmidon Reef, 18°16.69'S 147°23.21'E, Club 21 Reef, 19°22.36'S 149°01.05'E, Loadstone Reef, 18°41.29'S 147°05.83'E and 18°42.05' 147°05.98'E, Turner Cay, ca. 21°43S' 152°33'E, Great Palm Island, 18°40.60'S 146°34.29'E and 18°40.98'S 146°35.19'E, Sand Bank No. 1, 14°18'S 145°12'E, Chinaman Reef, ca. 22°00'S 152°40'E, Lizard Island, Boulder Reef, ca. 15°24'S 145°27'E, Yonge Reef, ca. 14°36'S 145°38'E, Rosser Reef, ca. 15°37'S 145°33'E, Reef 14-056, 14°19.5'S 144°57.5'E, Lavers Cay, 21°13'S 151°59'E, East Cay, 21°29'S 152°33'E; Reef 21-433, 21°33'S 151°28.5'E, Reef 21-551, 21°57.54'S

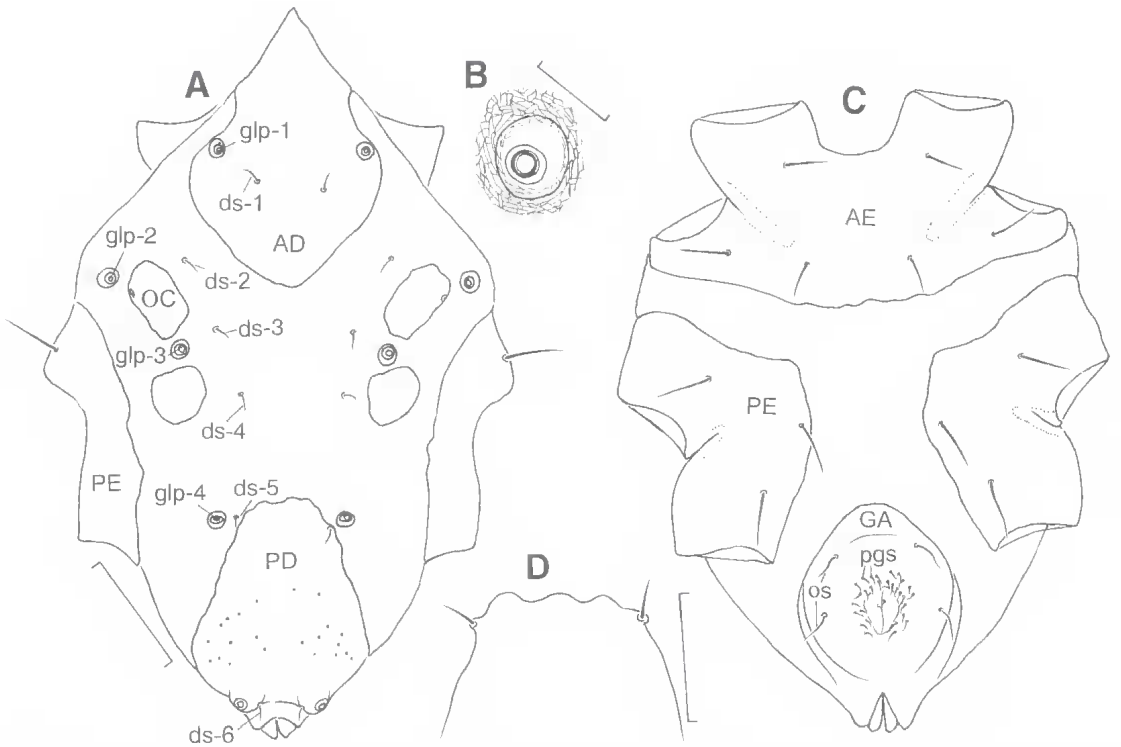

FIG. 3. *Halacarus chilcottensis* sp. nov., ♂. A, idiosoma, dorsal view; B, gland pore 2; C, idiosoma, ventral view; D, anterior part of PD. AD, anterior dorsal plate; AE, anterior epimeral plate; ds-1 to ds-6, dorsal setae; GA, genitoanal plate; glp-1 to glp-4, gland pores; OC, ocular plate; os, outlying perigenital setae; PE, posterior epimeral plate; PD, posterior dorsal plate; pgs, perigenital setae. Scale bars: A (C) = 100μm; B = 20μm; D = 50μm.

152°04.60'E, Reef 21-149, 21°06'S 151°43'E, 22 Apr. 1999, coarse sand at 0.5m, Reef 22-088, 22°01.5'S 152°09'E. Queensland Plateau: QMS105611-105613, 2 ♂, 1 ♀, Chilcott Islet, 16°56.611'S 150°0.177'E &16°56.51'S 150°0.4'E. Western Australia: WAM, 1 ♂, off Montebello Islands, 20°22.12'S 115°31'E. All material was collected in mostly coarse sediment at 1-17m depth.

REMARKS. These specimens are first records of the species from NE and NW Australia. The only previous records were from the type locality on Rottnest Island, WA (Bartsch, 1993a).

H. discophorus is characterised by a PD, the insertion of ds-5 and ds-6 on the same sclerites as glp-4 and glp-5, respectively (Fig. 6A), and a pair of plates between glp-4 and glp-5 in the male (Fig. 6A). It can be further distinguished from similar species (e.g. *H. flavellus* Bartsch, 1993a) by having only one side of the spinose setae on tibia II pectinate (Fig. 6B) instead of both sides.

Males from the Great Barrier Reef, measuring 502-578μm, are slightly smaller than the type from Rottnest Island (610μm) or the two males from the Queensland Plateau (586μm and 641μm); the specimen from the Montebello Islands in Western Australia is even smaller (470μm). However, no other differences were detected and these specimens are therefore regarded as conspecific.

Halacarus heraldensis sp. nov.
(Figs 7-9)

ETYMOLOGY. From the type locality.

MATERIAL: HOLOTYPE: QMS105621, ♂, Queensland Plateau, Herald Cays, 16°57.171'S 149°12.036'E, 16 Sep. 1998, G.A. Diaz-Pulido, coarse sand at 5-15m. PARATYPES: QMS105622, 1 ♂, QMS105623, 1 ♀, ANIC, 1 ♂, ZMH A76/00, 1 ♂, data as for holotype.

DESCRIPTION. *Male.* Idiosoma 386-417μm long (holotype 386μm). Dorsal plates covered by epicuticle structured (Fig. 7B), but PD with such epicuticle only anteriorly and laterally, remainder finely punctate (Fig. 7E). Membranous cuticle between plates (Fig. 7D). AD drawn out anteriorly into a short frontal spine (Fig. 7A); posterior margin broadly convex; with

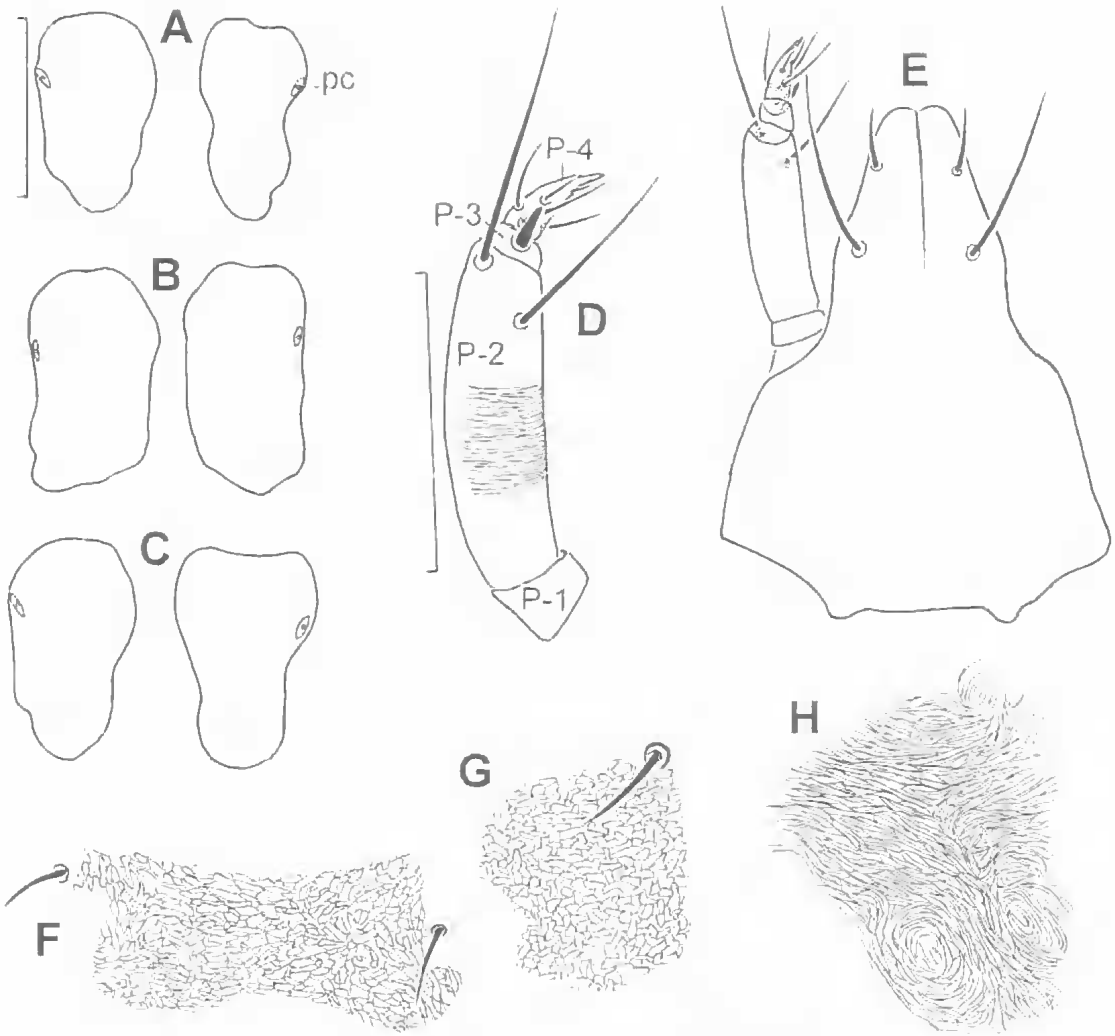

FIG. 4. *Halacarus chilcottensis* sp. nov., ♂. A-C, left and right ocular plate, respectively, in 3 specimens; D, left palp, dorsal view; E, gnathosoma, ventral view; F, detail of epicuticle on anterior dorsal plate between setae ds-1; G, detail of membranous cuticle between plates and seta ds-4; H, detail of epicuticle on anterior epimeral plate. pc, pore canaliculus, P-1 to P-4, palp segments. Scale bars: A(B,C,E), D (F,G,H) = 50μm.

pair of glp-1 and pair of ds-1. AD extending beyond level of ds-2 but not to level of ds-3. Pore glp-2 on OC, glp-3 in membranous cuticle between AE and PE (Fig. 7C), glp-4 and glp-5 on PD. OC variable in shape between and within specimens (Fig. 8A-D); pore canaliculus either on OC (right plate in Fig. 8B) or separated from OC in membranous cuticle (Fig. 8A). Posterior to glp-3 a pair of variably shaped plates (Fig. 8A-D). PD with anterior margin rounded (Fig. 7A) or more uneven (Fig. 7E); in posterior half with a series of minute pits laterally. Posterior margin of AE variable; epicuticle similar to AD (Fig. 7B). AE with 3 pairs of setae; PE with 4 setae; no setae in membranous ventral cuticle (Fig. 7C). One pair of outlying pgs in posterior half of GA, 35-42 pgs closely surrounding GO.

Rostrum about as long as gnathosomal base (Fig. 8F). Palp smooth; both setae on P-2 inserted distally (Fig. 8G). P-3 with blunt spine.

Leg segments faintly striated or smooth, in deeper layers punctate, most conspicuously on basifemur I. Chaetotaxy (trochanter - tibia): I 1-2-7 (6,8)-8-15(14) (Fig. 9A), II 1-3(4)-6(7)-6-10(9) (Fig. 9B), III 2-2-5-5-7 (Fig. 9E), IV 1-2-4-6-6 (Fig. 9F). Telofemur I usually with 4 spines (2 heavy and 2 less heavy). On one side of

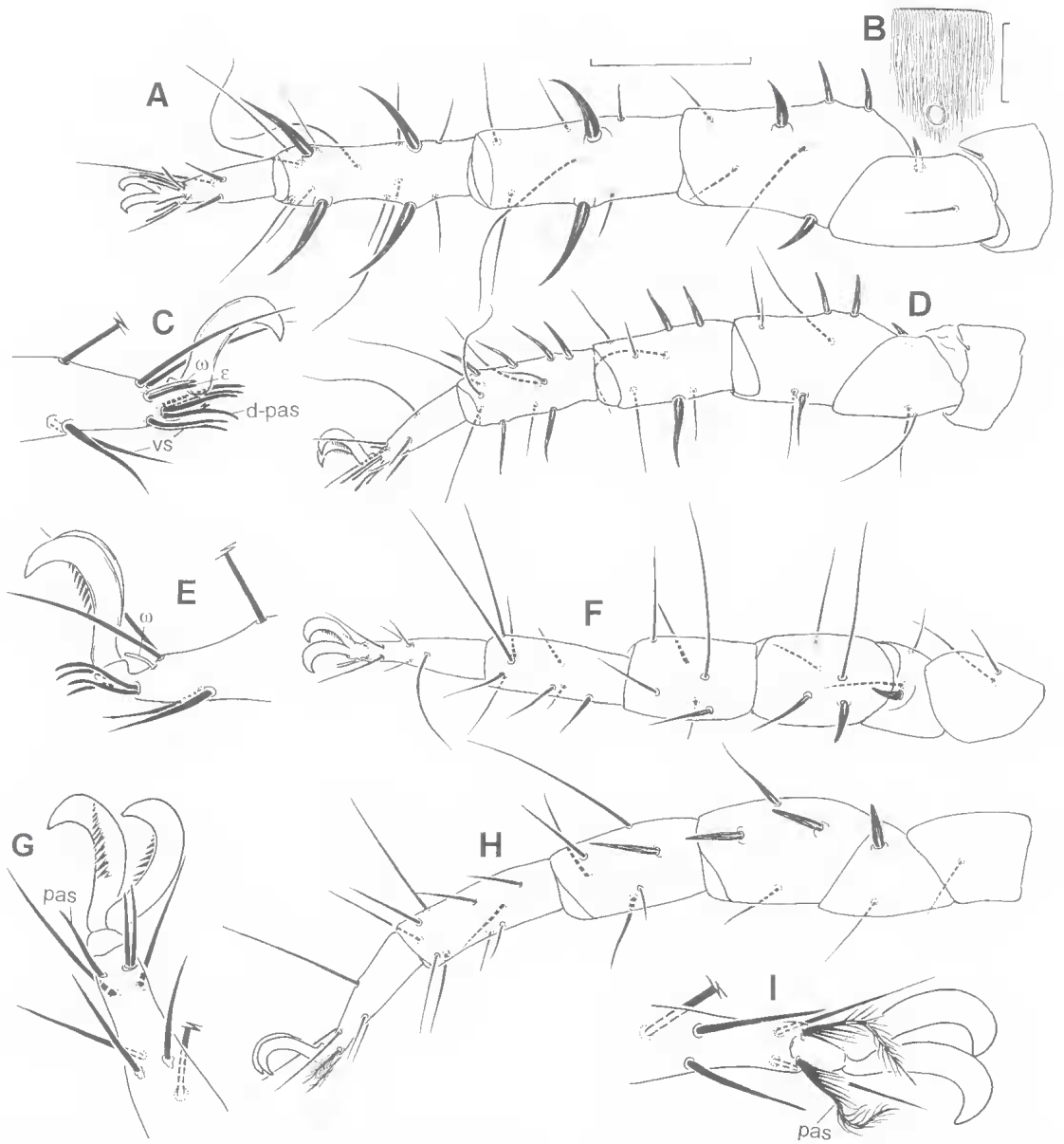

FIG. 5. *Halacarus chilcottensis* sp. nov., ♂; A, right leg I, ventral view; B, detail of cuticle surrounding insertion socket on telofemur I; C, tarsus I, lateral view; D, leg II, ventromedial view; E, tarsus II, medial view; F, left leg III, dorsal view; G, left tarsus III, ventral view; H, leg IV, medial view; I, left tarsus IV, ventral view. d-pas, doubled parambulacral seta; vs, ventral setae on tarsus; ε, famulus; ω, solenidion. Scale bars: A (D,F,H) = 100μm, B (C,E,G,I) = 20μm.

one specimen with additional ventral spine (Fig. 9C), and in another specimen one of the 2 less heavy spines lacking on one leg. Telofemur II with single dorsal spine (Fig. 9B), on one leg in one specimen with 2 spines (Fig. 9D). Tibia III with slightly bipectinate medial seta in proximal half; similar seta medially on genu IV. Telofemur IV with 2 dorsal spines. Tarsus I with 3 dorsal setae, 2 pairs of ventral setae (the distal pair eupathidiform), and pair of doubled pas; solenidion and famulus closely associated and of similar length and thickness (as illustrated for *H.*

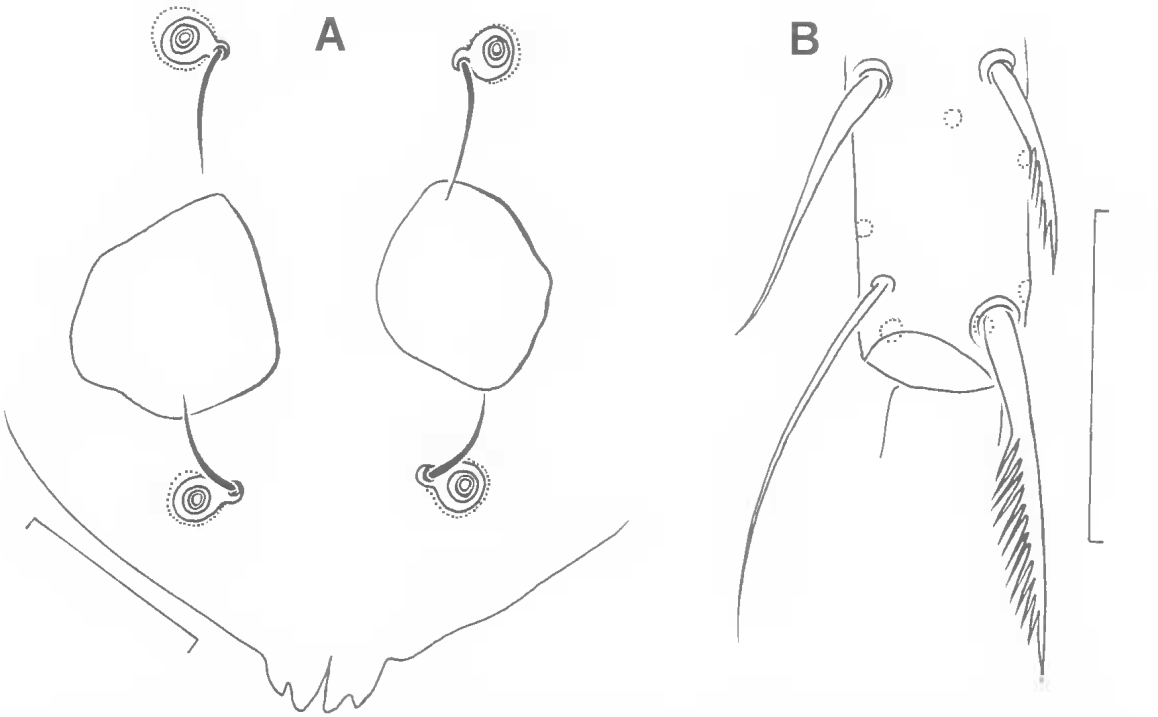

FIG. 6. *Halacarus discophorus* Bartsch, Great Barrier Reef ♂. A, posterior idiosoma, dorsal view; B, right tibia II, ventral view, positions of dorsal setae indicated by their insertion sockets. Scale bars = 50μm.

chilcottensis in Fig. 5C). Tarsus II with 3 dorsal setae, pair of ventral setae and pair of doubled pas of which the ventral branch is more delicate than the dorsal one. Tarsus III with 4 dorsal setae, one doubled pas, one pas singlet, and pair of ventral setae. Tarsus IV with 3 dorsal setae, pair of ventral setae, and pair of plumose pas singlets. Paired claws of legs I and IV smooth, of tarsi II and III with conspicuous pecten. All tarsi with minute empodial claw.

Female. Idiosoma 411μm long. PD more pointed anteriorly than in male; glp-4 and ds-5 on small platelets separated from PD (Fig. 8E). GA with 3 pairs pgs, and 2 pairs sgs (Fig. 7F). Pair of pas on tarsus IV undivided.

REMARKS. *H. heraldensis* belongs to the *membraneus* group. Other species in this group with the glp-3 on the OC are *juliani*, *sabulonis* and *membraneus*. *H. membraneus* differs from *H. heraldensis* in the AD being wide throughout and extending to the level of ds-2, and in having 8 setae on tibia IV and 5 setae on telofemur III.

Bartsch (1981) described only a single pair of ventral setae on tarsus I for *H. membraneus*, in contrast to the 2 pairs in *H. heraldensis*. She also illustrated a ventral spine on telofemur II that appears shorter than the corresponding spine in *H. heraldensis*. However, both characters are not suitable for separating *H. membraneus* and *H. heraldensis*, as in the holotype of *H. membraneus* 2 pairs of ventral setae occur on tarsus I and the ventral spine on telofemur II is broken off.

Halacarus juliani sp. nov.
(Figs 10, 11)

ETYMOLOGY. In honour of Julian Otto.

MATERIAL. HOLOTYPE, QMS105672, ♀, Great Barrier Reef Marine Park, No Name Reef, ca. 14°39'S 145°40'E, 9 Oct. 1998, medium coarse sand at 6m. PARATYPES: Great Barrier Reef Marine Park: QMS105671, 1 ♀, Yonge Reef, ca. 14°36'S 145°38'E, 10 Oct. 1998, coarse sand & rubble at 9m; ANIC, 1 ♀, ♂ onge Reef, ca. 14°36'S 145°38'E, G. Diaz-Pulido, medium coarse sand at 7m; ZMH A77/00, 1 ♀, Reef 14-056, 14°19.5'S 144°57.5'E, 21 Oct. 1998, P. Tomkins, medium coarse sand in shallows; QMS 105670, 1 ♀, Reef 13-050, backreef, 13°19'S 143°58.5'E, 29 Aug. 1999, C. Bastidas, K. Fabricius & S. Uthicke, medium coarse sand at 2m.

Female. Idiosoma 416-428μm long (holotype 416μm). AD either developed into a short spine (Fig. 10A) or somewhat more obtuse (Fig. 10B); with ds-1 and glp-1; covered by reticulate epicuticle (Fig. 10F). AD extending beyond level

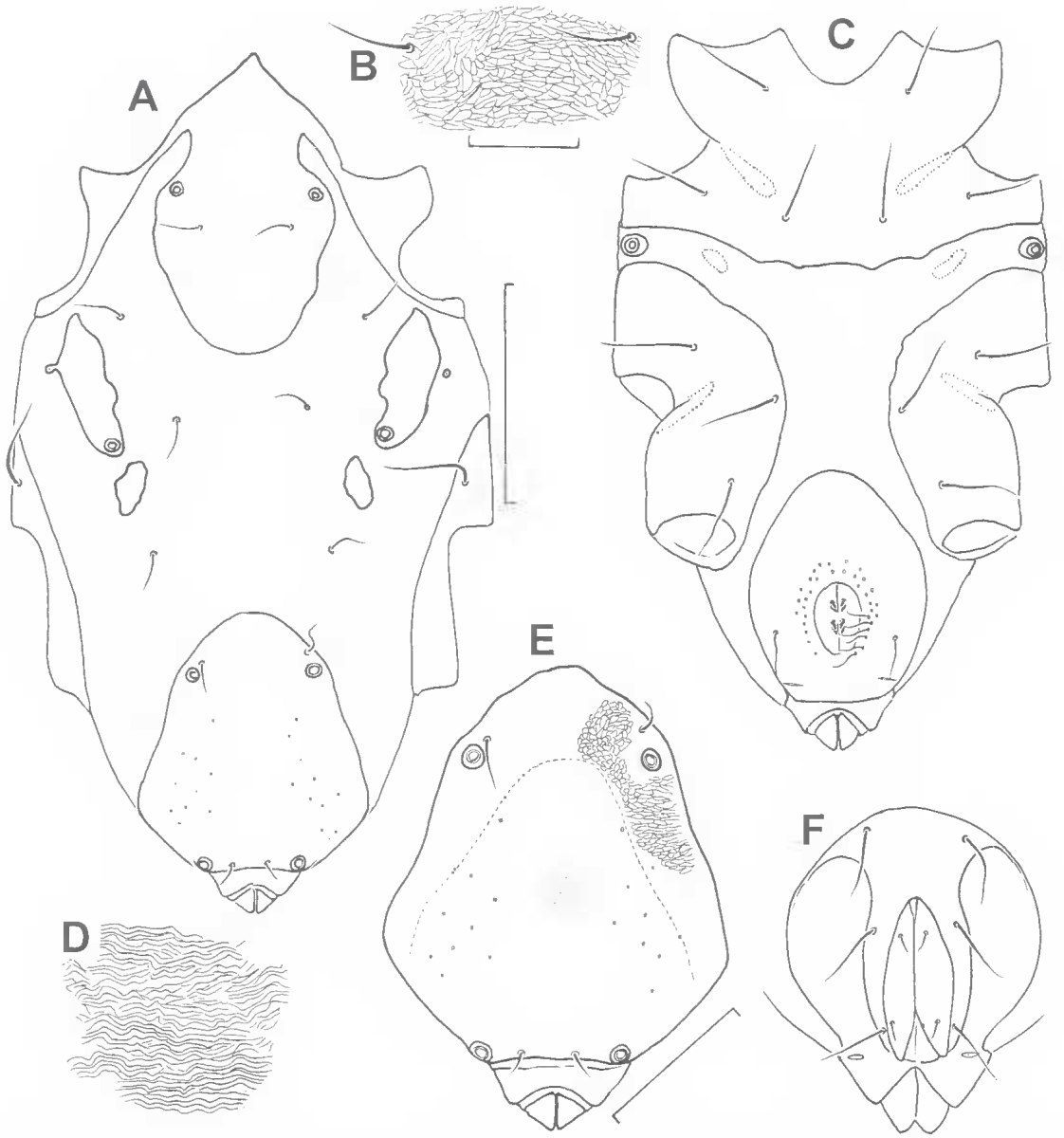

FIG. 7. *Halacarus heraldensis* sp. nov., adult. A, ♂, idiosoma, dorsal view; B, adult; detail of epicuticle between setae ds-1 on anterior dorsal plate; C, ♂, idiosoma, ventral view; D, detail of cuticular striations of membranous dorsal cuticle; E, ♂, posterior dorsal plate; F, ♀, genitoanal plate. Scale bars: A (C) = 100μm; B (D) = 20μm; E(F) = 50μm.

of ds-2 but not to level of ds-3. Setae ds-2, ds-3 and ds-4 in membranous cuticle. OC longer than wide, broadest in anterior half, otherwise variable in shape (Fig. 10A,D); with pore canaliculus anterolaterally and glp-2 posteriorly; postero-medially with muscle scar. Pair of platelets posterior to OC smaller than OC and variable in shape. Pore glp-3 in membranous cuticle between AE and PE; glp-4 anterolateral to PD on same platelet as ds- 5 (Fig. 10E); glp-5 on PD. PD covered with reticulated epicuticle (Fig. 10E); margins, after converging towards anterior, widening into a asymmetrical protrusion (Fig. 10A,E). Posterior margin of AE uneven and variable, epicuticle (Fig. 10G) much more finely reticulate-striate than on AD (Fig. 10F).

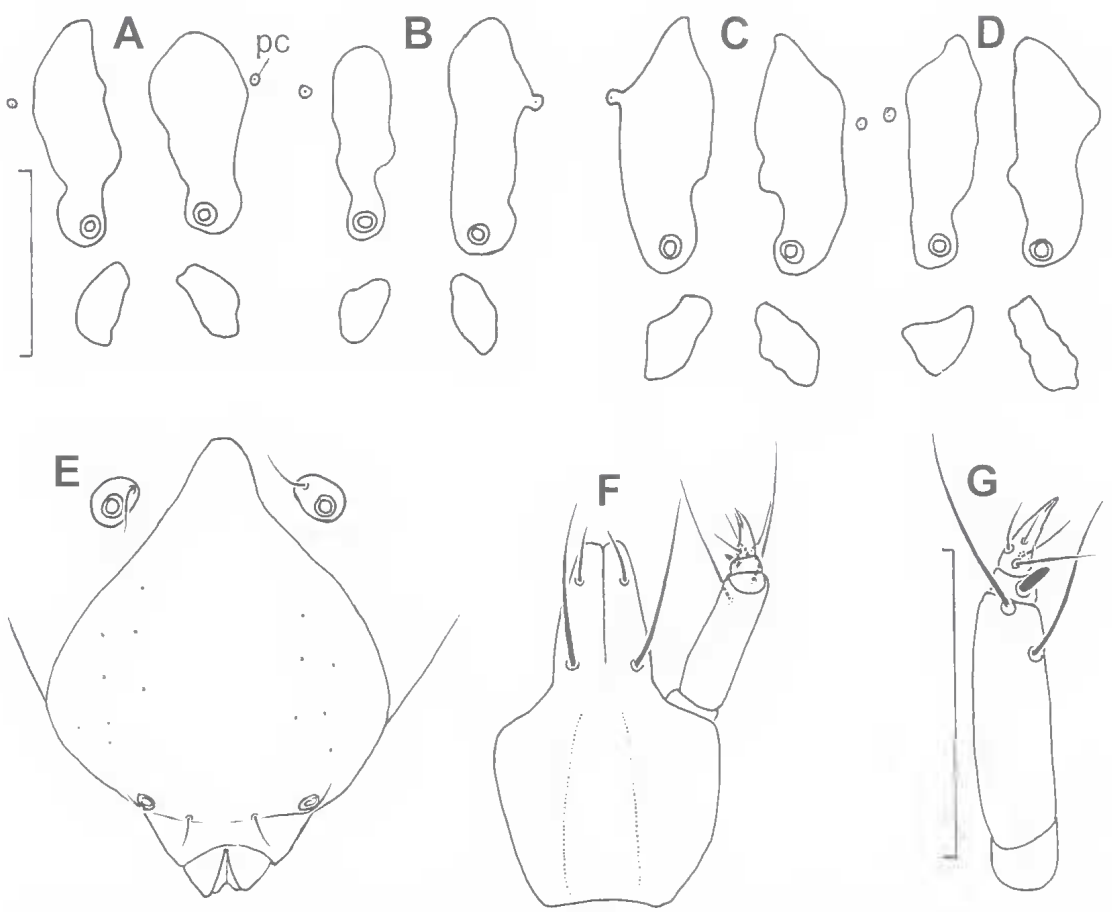

FIG. 8. *Halacarus heraldensis* sp. nov., adult; A-D, ocular plates and posterior platelets in 4 ♂s; E, ♀, posterior dorsal plate; F, ♀, gnathosoma, ventral view; G, ♀, left palp, dorsal view. pc, pore canaliculus. Scale bars: A (B-D, E, F), G = 50μm.

Rostrum about as long as gnathosomal base. Palp surpassing rostrum (Fig. 10H); smooth; both setae on P-2 inserted distally (Fig. 10I); P-3 with blunt spine.

All leg segments with striated epicuticle. Chaetotaxy (trochanter - tibia): I 1-2-7-8-15 (Fig. 11A), II 1-3-6-6-10 (Fig. 11B), III 2-2-5-5-7 (Fig. 11C), IV 1-2-4-6-6 (Fig. 11D). Telofemur I with 4 spines (2 heavy and 2 less heavy). Telofemora II and III with single dorsal spine. Telofemur IV with 2 dorsal spines. Tarsus I with 3 dorsal setae, 2 pairs of ventral setae (the distal pair eupathidiform), and pair of doubled pas; solenidion and famulus closely associated and of similar length and thickness (as in Fig. 5C). Tarsus II with 3 dorsal setae, pair of ventral setae and pair of doubled pas of which the ventral branch is more delicate than the dorsal one. Tarsus III with 4 dorsal setae, 2 pas singlet or one doubled pas and one pas singlet, and pair of ventral setae. Tarsus IV with 3 dorsal setae, pair of ventral setae, and pair of setiform (not plumose as in male) pas singlets. Paired claws of legs I,IV smooth, of tarsi II, III with conspicuous pecten. All tarsi with minute empodial claw.

Male. Unknown.

REMARKS. *H. juliani* is a species of the *membraneus* group. Other species in this group which have glp-3 on the OC are *H. membraneus* , *H. sabulonis* and *H. heraldensis*. *H. membraneus* differs from *H. juliani* by having 8 setae on tibia IV and 4 on telofemur III and *H. sabulonis* differs in the epicuticular pattern on the AE (Figs 10G, 15D). *H. heraldensis* can be separated from *H. juliani* by the reticulate epicuticle covering only the anterior and anterolateral, but not the medial part of the PD, as well as by a different

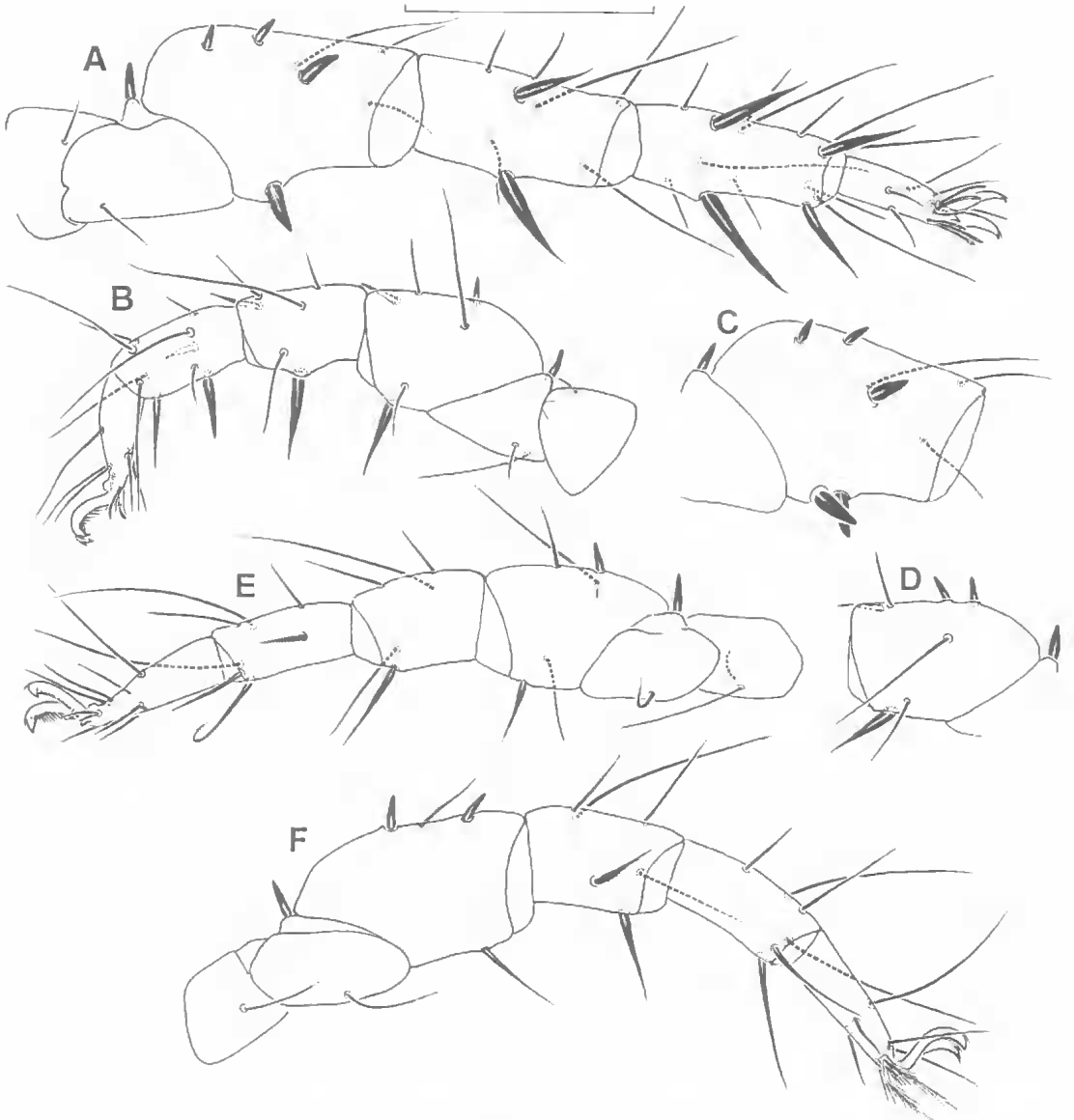

FIG. 9. *Halacarus heraldensis* sp. nov., ♂; A, leg I, ventromedial view; B, leg II, dorsolateral view; C, telofemur I, ventromedial view; D, basifemur II, dorsolateral view; E, leg III, ventromedial view; F, leg IV, ventromedial view. Scale bars: A (B-F) = 100μm.

epicuticular pattern on the AE and a different shape of the anterior part of the PD.

Halacarus rarus sp. nov.
(Figs 12-14)

ETYMOLOGY. *Rarus*, Latin = rare; in reference to the single specimen that has been found as yet.

MATERIAL. HOLOTYPE: QMS105638, ♀, Great Barrier Reef Marine Park, 18°25.25'S 146°40.65'E, Bramble Reef, 10 Apr. 1998, chunks of coral rubble at 3-6m.

DESCRIPTION. *Female.* Idiosoma 512μm long. AD, AE, OC and PD with finely striated epicuticle (Fig. 13A-D), on PE and AE developed into a distinctly fingerprint-like pattern (Fig. 13D). AD anteriorly acuminate (Fig. 12A); pair of large glp-1 half way along plate and distinctly posterior to glp-1 a pair of ds-1 separated by an interval similar to that between

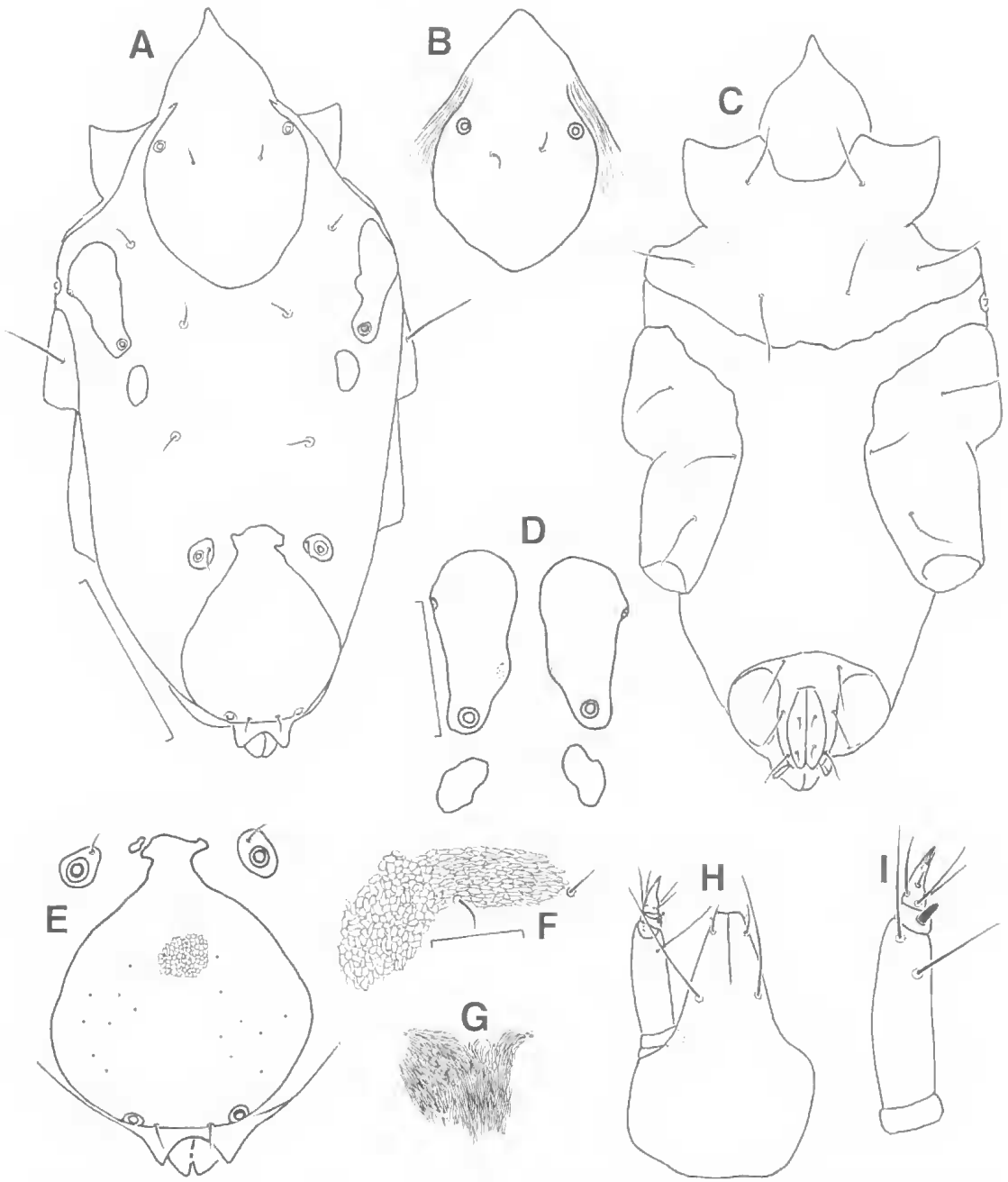

FIG. 10. *Halacarus juliani* sp. nov., ♀. A, idiosoma, dorsal view; B, anterior dorsal plate; C, idiosoma, ventral view; D, left and right ocular plates, respectively, of one specimen; E, posterior dorsal plate; F, detail of epicuticle on anterior dorsal plate near setae ds-1; G, detail of epicuticle on anterior epimeral plate; H, gnathosoma, ventral view; palp, dorsal view. Scale bars: A (B,C) = 100μm; D (E,H) = 50μm; F(G) = 20μm.

the outer rims of glp-1 (Fig. 13A). Pore glp-2 on anterior part of PE. OC slightly longer than wide, narrowing posteriorly; anteriorly with inconspicuous cornea, posteriorly with glp-3; part of plate posterior to glp-3 barely visible; pore canaliculus distinctly anterior to glp-3 near lateral margin. Setae ds-2, ds-3 and ds-4 in membranous cuticle. PD with reticulated pattern underneath striated epicuticle (Fig. 12A); part of PD anterior to glp-4 similar in length to interval

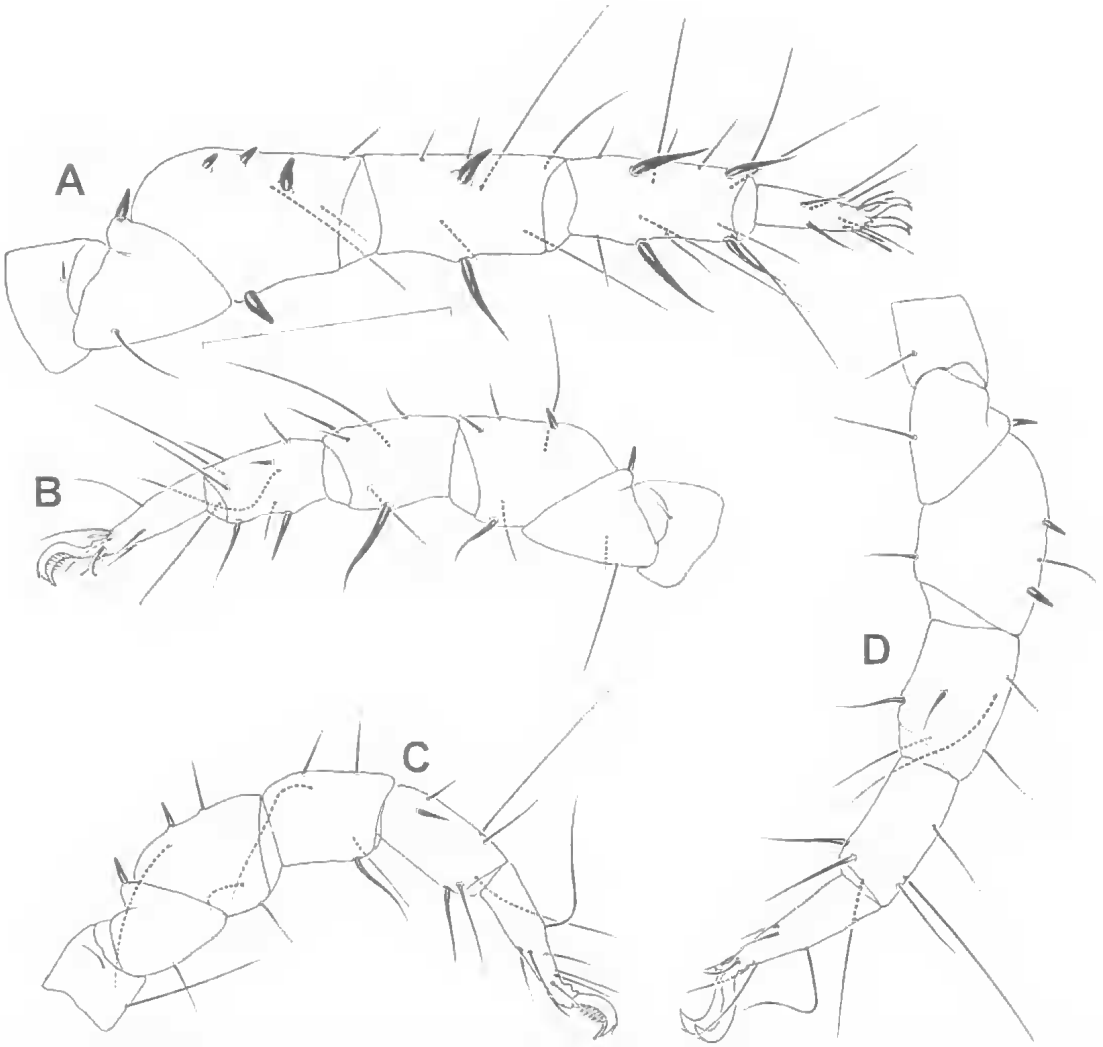

FIG. 11. *Halacarus juliani* sp. nov., ♀. A, leg I, ventromedial view; B, leg II, ventromedial view; C, leg III, ventromedial view; D, leg IV, ventromedial view. Scale bars: A (B,C,D) = 100μm.

between glp-4 and glp-5; ds-5 level with glp-4; ds-6 level with glp-5; glp-4 not protruding laterally. AE with 3 pairs of setae (Fig. 12B) and several conspicuous muscle scars. PE with one dorsal and 3 ventral setae, along anterior margin a conspicuous row of muscle scars. GA with 2 pairs of pgs, and 5 pairs of sgs (Fig. 12B).

Gnathosomal base striated (Fig. 13E). Rostrum slender, slightly longer than gnathosomal base; one pair of maxillary setae proximally, the other distally. Segment P-2 distinctly striated and bulged proximally (Fig. 13F); most proximal seta inserted on protrusion about half way along segment, other much longer seta inserted apically; P-3 with stout spine medially.

Leg chaetotaxy (trochanter - tibia): I 1-2-8-10-12 (Fig. 14A); II 1-4-7-8-11 (Fig. 14B), III 2-2-3-4-7 (Fig. 14C); IV 1-2-3-4-7 (Fig. 14D). Leg I distinctly heavier than other legs; telofemur and genu each with 2 and tibia with 4 ventral spines, the ventromedial one on the telofemur blunt, the others tapering. Thickened or spine-like setae also dorsally on all basifemora and ventrally on genu and tibia II, tibia III and tibia IV; the ventromedial thickened seta on tibia II coarsely bipectinate in distal half. All tarsi with paired claws and small median claw. Paired claws of tarsus I smooth, those of tarsi II-IV with delicate pecten and accessory process.

Male. Unknown.

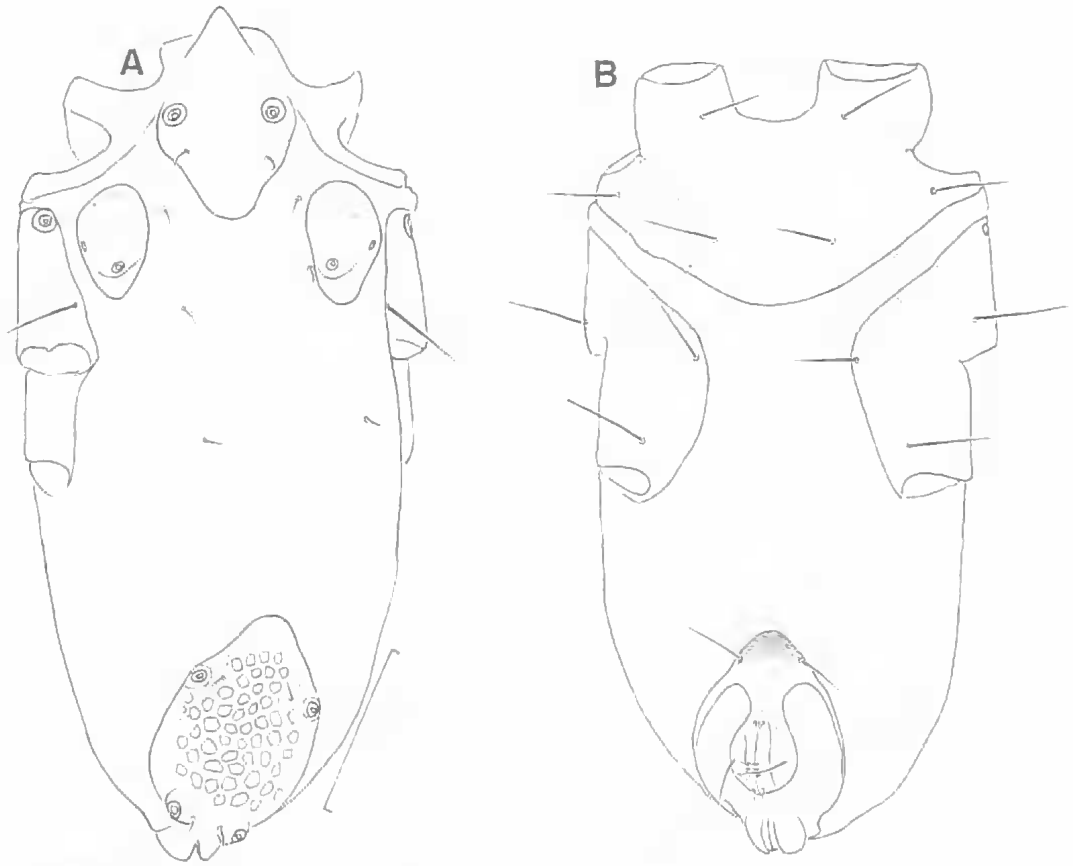

FIG. 12. *Halacarus rarus* sp. nov., ♀; idiosoma: A, dorsal view; B, ventral view. Scale bar: A (B) = 100μm.

REMARKS. *H. rarus* is a member of the *ctenopus* group (Bartsch, 1993b), species of which inhabitat warm waters worldwide. The *ctenopus* group is characterised by the combination: AD, OC and PD present; all idiosomal plates, gnathosoma and legs covered with delicately striated epicuticle; 4th pair of gland pores on PD; female GA with 2 pairs of pgs, swollen integument on either side of GO set off from anterior plate; tibia I with 2 pairs of tapering spines; ventromedial spine on tibia II bipectinate. Other species are *ctenopus* Lohmann, 1893, *malaysius* Bartsch, 1993b, *mitrellus* Bartsch, 1993a, *mooreus* Bartsch, 1992, *oblongus* Lohmann, 1893, *subtilis* Viets, 1940, and *turgidus* Viets, 1952 (Newell, 1984). The only other species in this group in which glp-2 is known to be on the anterior part of the PE is *H. mitrellus* from Rottnest Island. *H. mitrellus* differs from *H. rarus* in at least 3 aspects: the female PD extends almost to the level of ds-4; the pore canaliculus on the OC is slightly posterior to glp-3; the ventral spines on telofemur I are, according to Bartsch's (1993a) illustration, both inserted close to the distal margin.

The SE Australian *H. oblongus* Lohmann, 1893 is similar to *H. rarus*, but differs, according to Lohmann's (1893) illustration, in that pores glp-4 protrude from the PD on either side and setae ds-1 are inserted closer together than in *H. rarus*. I have been unable to locate the type material and hence to verify these characters.

Halacarus sabulonis sp. nov.
(Figs 15, 16)

ETYMOLOGY. *Sabulum*, Latin = coarse sand, gravel; referring to the species' habitat.

MATERIAL. HOLOTYPE: QMS105630, ♂. Great Barrier Reef Marine Park, ca. 15°24'S 145°27'E, Boulder Reef, 8 Oct. 1998, A. Thompson, coarse sand at 2m. PARATYPES: Great Barrier Reef Marine Park: QMS105627-105629, 105631, 4 ♂, QMS105632-105635, 4 ♀, ZMH A78/00, 1 ♂, 1 ♀, ANIC, 1 ♂, 1 ♀, data as for holotype; QMS105636/105637, 2 ♂, ca.

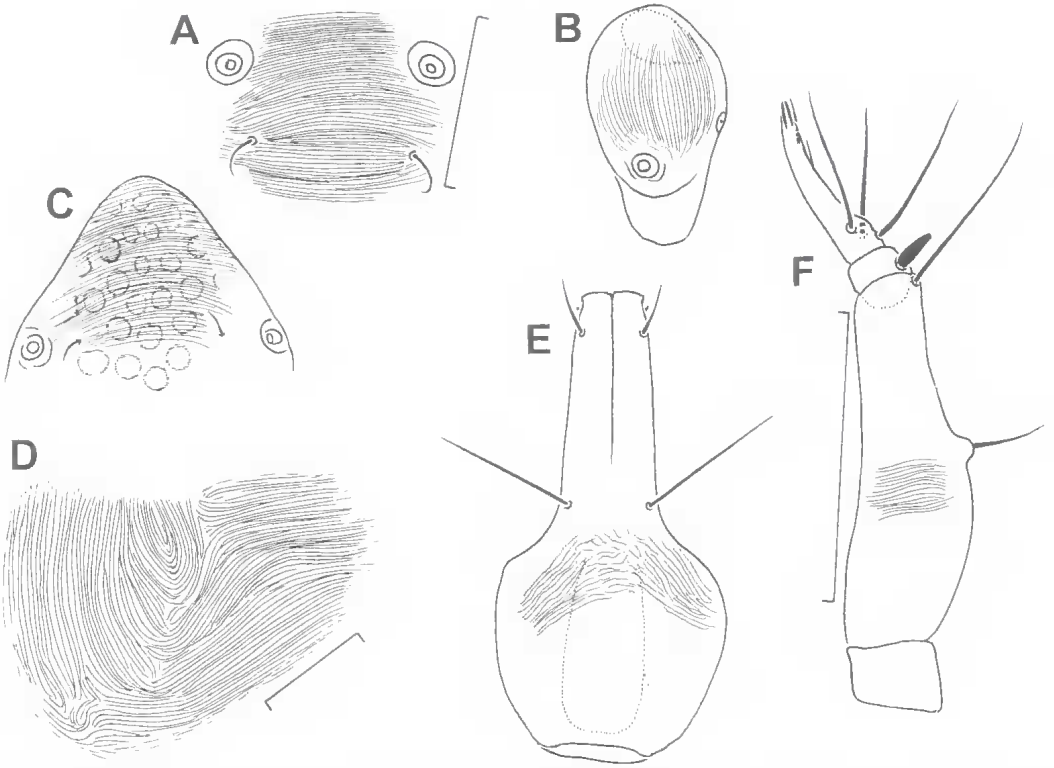

FIG. 13. *Halacarus rarus* sp. nov., ♀. A, detail of cuticle on anterior dorsal plate between glp-1 and ds-1; B, right ocular plate; C, anterior part of posterior dorsal plate; D, detail of cuticle of ventral part of posterior epimeral plate; E, gnathosoma, ventral view; F, right palp, ventromedial view. Scale bars: A (B,C,E), F = 50μm; D = 20μm.

21°09.80'S 151°41.77'E, Reef 21-155, 20 Apr. 1999, coarse sand (mainly *Halimeda* flakes) at 15m.

DESCRIPTION. *Male.* Idiosoma 383-419μm long (holotype 405μm). AD usually drawn out into a short spine (Fig. 15A), in one specimen more obtuse (Fig. 15B) perhaps resulting from a downward deflected and hence invisible tip; posterior margin truncate to convex. AD extending well beyond level of ds-2 but not to level of ds-3; structure of epicuticle (Fig. 15D). Setae ds-2, ds-3 and ds-4 in membranous cuticle. OC variable in shape between and within specimens (Fig 15A,H); wider anteriorly than posteriorly; anterolaterally with pore canaliculus and posteriorly with glp-3. Posterior to OC with pair of small variable plates. PD with variable anterior margin (Fig. 15A,I,J); anteriorly with glp-4 and ds-5 and posteriorly with glp-5 and closely associated ds-6. Posterior margin of AE variable, ranging from gently rounded to jagged; reticulation of epicuticle (Fig. 15E), only slightly finer than on AD (Fig. 15D). Three pairs of setae on AE, 4 setae on PE, but no setae in membranous ventral cuticle. GA with a pair of outlying pgs in posterior half, 28-39 pgs closely surrounding GO; sgs not clear.

Rostrum about as long as gnathosomal base. Palp surpassing rostrum (Fig. 15F); smooth; both setae on P-2 inserted distally (Fig. 15G). P-3 with blunt spine.

Only basifemora and telofemora dorsally faintly striate, surface of other segments smooth, in deeper cuticular layers with fine canaliculi. Leg chaetotaxy (trochanter - tibia): I 1-2-7-8-15 (Fig. 16A), II 1-3-6-6-10 (Fig. 16B), III 2-2-5-5-8 (Fig. 16C), IV 1-2-4-6-6 (Fig. 16D). Telofemur I with 4 spines (2 heavy and 2 less heavy). Telofemora II and III with single dorsal spine. Telofemur IV with 2 dorsal spines. Tarsus I with 3 dorsal setae, 2 pairs of ventral setae (distal pair eupathidiform), and pair of doubled pas; solenidion and famulus closely associated and of similar length and thickness (Fig. 5C). Tarsus II with 3 dorsal setae, pair of ventral setae and pair of doubled pas of which the ventral branch is more delicate than the dorsal one. Tarsus III with

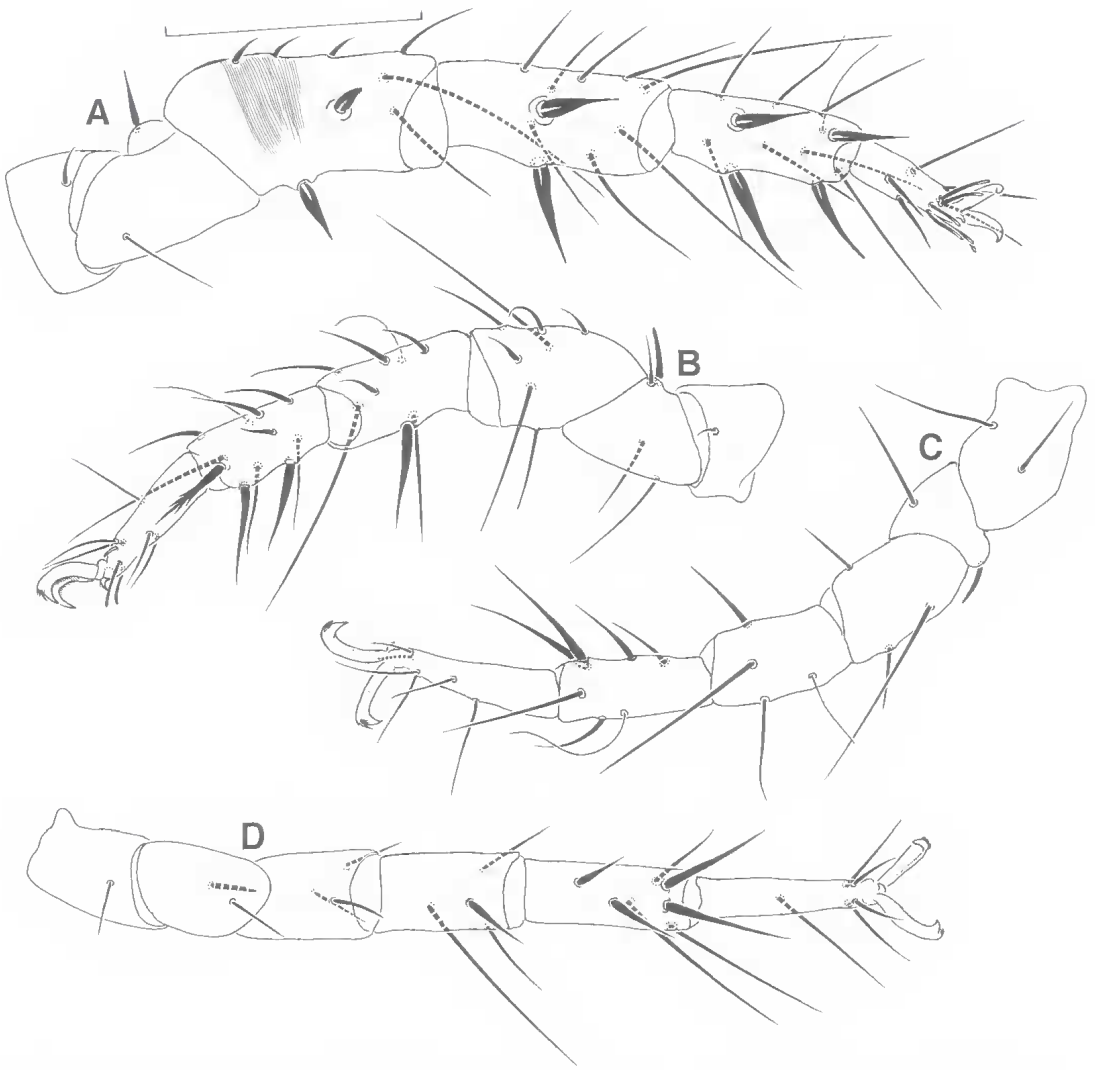

FIG. 14. *Halacarus rarus* sp. nov., ♀. A, leg I, ventromedial view; B, leg II, ventromedial view; C, leg III, dorsolateral view; D, right leg IV, ventral view. Scale bar: A(B-D) = 100μm.

4 dorsal setae, a doubled pas, a pas singlet, and pair of ventral setae. Tarsus IV with 3 dorsal setae, pair of ventral setae, and pair of plumose pas singlets. Paired claws of legs I and IV smooth, those of tarsi II and III with conspicuous pecten. All tarsi with minute empodial claw.

Female. Idiosoma 379-448μm long. Pair of glp-4 separated from PD (Fig. 15K). Pair of ds-5 usually on same platelet as glp-4 (Fig. 15K), in one specimen ds-5 separated from glp-4 on one side. GA with 3 pairs pgs and 2 pairs sgs. Pair of pas on tarsus IV setiform, not plumose as in male.

REMARKS. *Halacarus sabulonis* sp. nov. belongs to the *membraneus* group. Other species in the group with glp-3 on the OC are *juliani*, *heraldensis* and *membraneus*. *H. sabulonis* differs from them by having eight instead of 7 setae on tibia III and by the reticulated epicuticle of the AE consisting of cells that are approximately as long as they are wide and hence not as slender as in the other 3 species.

Halacarus striolus sp. nov.
(Figs 17, 18)

ETYMOLOGY. *Stria*, Latin = line; referring to the striated epicuticle on the legs.

MATERIAL: HOLOTYPE: QMS105624, ♂, Great Barrier Reef Marine Park, Bylund Cay, ca. 21°47'S

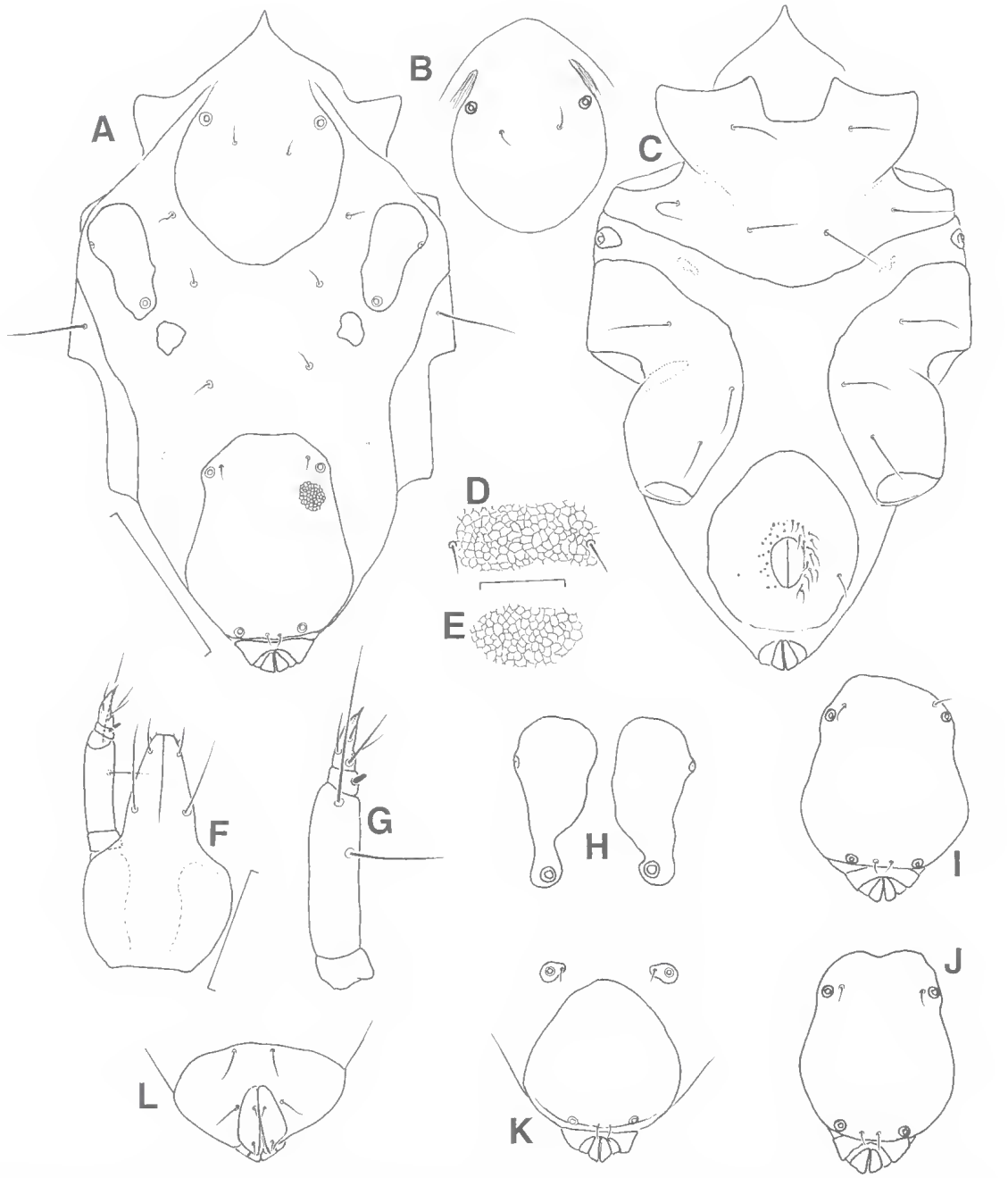

FIG. 15. *Halacarus sabulonis* sp. nov., adult. A, ♂, idiosoma, dorsal view; B, ♂, anterior dorsal plate; C, ♂, idiosoma, ventral view; D, detail of epicuticle on anterior dorsal plate between setae ds-1; E, detail of epicuticle of anterior epimeral plate; F, ♂, gnathosoma, ventral view; G, ♂, palp, dorsal view; H, left and right ocular plates, respectively, of one ♂; I, J, ♂, posterior dorsal plate of two specimens; K, ♀, posterior dorsal plate; L, ♀ genitoanal plate. Scale bars: A (B,C, I-L) = 100μm; D (E,G) = 20μm; F (H) = 50μm.

152°24'E, 17 Apr. 1998, coarse sand just above low tide mark, sediment depth 10-20cm. PARATYPES: Great Barrier Reef Marine Park: QMS105625, 1 ♀, data as for holotype; QMS195626, 1 ♂, Reef 21-149, 21°06'S 151°43'E, reef flat, 22 Apr. 1999, coarse sand at 0.5m; ZMH A79/00, 1 ♂, East Cay, 21°29'S 152°33E', 18 Apr.

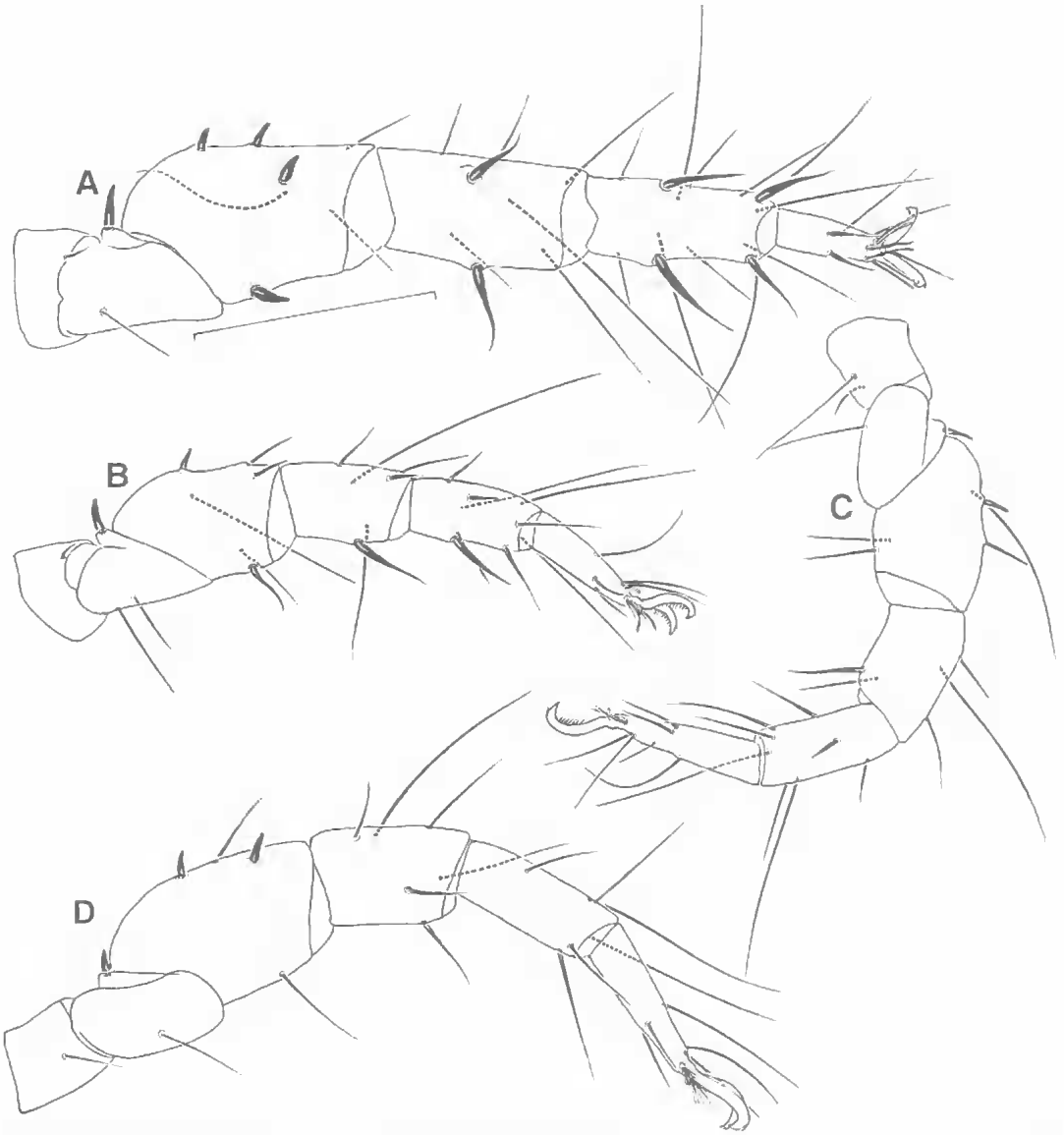

FIG. 16. *Halacarus sabulonis* sp. nov., ♂. A, leg I, ventromedial view; B, leg II, ventromedial view; C, leg III, ventromedial view; D, leg IV, ventromedial view. Scale bar: A (B-D) = 100μm.

1999, reef flat off front, coarse sand; ANIC, 1 ♂, ZMH, 1 ♀, Chinaman Reef, ca. 22°00'S 152°40'E, reef flat, 10 Dec. 1998, G. Coleman, coarse sand (mainly *Halimeda* flakes) at 3m.

DESCRIPTION. *Male.* Idiosoma 372-403μm long (holotype 394μm). AD, OC, PD and AE covered by reticulated epicuticle (Fig. 17A). AD developed into a stout spine, usually shaped as in Fig. 17A, in one specimen as in Fig. 17B. Setae ds-2, ds-3 and ds-4 in membranous cuticle. OC widest in anterior half, otherwise of variable shape; anterolaterally with pore canaliculus. Pair of glp-3 separated from OC, except for one specimen where on one side OC and glp-4 are narrowly fused. Anterior margin of PD variable (Fig. 17G, H). Epicuticle on AE (Fig. 17D) finer than on AD (Fig. 17E). One pair of outlying pgs in posterior half of GA, 32-43 pgs closely surrounding GO; sgs not clearly seen.

Rostrum about as long as gnathosomal base. Both setae on P-2 inserted distally (Fig. 17J); P-3 with blunt spine.

All leg segments with striated epicuticle (shown for tibia I in Fig. 18E); underneath epicuticle punctate, most distinctly on basifemora and telofemora. Leg chaetotaxy (trochanter - tibia): I 1-2-7-8-15 (14) (Fig. 18A), II 1-3 -6-6-10 (9) (Fig. 18B), III 2-2-5-5-8 (Fig. 18C), IV 1-2-4-6-6 (Fig. 18D). Telofemur I with 4 spines (2 heavy and 2 less heavy). Telofemora II and III with single dorsal spine. Telofemur IV with 2 dorsal spines. Tarsus I with 3 dorsal setae, 2 pairs of ventral setae (the distal pair eupathidiform), and pair of doubled pas; solenidion and famulus closely associated and of similar length and thickness (Fig. 5C). Tarsus II with 3 dorsal setae, pair of ventral setae and pair of doubled pas of which the ventral branch is more delicate than the dorsal one. Tarsus III with 4 dorsal setae, a doubled pas and a pas singlet or 2 pas singlets, and pair of ventral setae. Tarsus IV with 3 dorsal setae, pair of ventral setae, and pair of plumose pas singlets. Paired claws of legs I and IV smooth, those of tarsi II and III with conspicuous pecten. All tarsi with minute empodial claw.

Female. Idiosoma 342-399μm long. Pair of glp-4 separated from PD (Fig. 17A, F). Seta ds-5 either on the same platelet as glp-4 (Fig. 17A) or separated from it in membranous cuticle (Fig. 17F). GA with 3 pairs of pgs and 2 pairs of sgs.

Pas on tarsus IV setiform, not plumose as in ♂.

REMARKS. *H. striolus* is a member of the *membraneus* group. It appears to be most similar to *H. sabulonis* but can be distinguished by the separation of the OC and glp-3 and by having striated epicuticle on all genua and tibiae.

The only other species in the *membraneus* group that has glp-3 separated from the OC is *H. chilcottensis*. *H. striolus* differs from it by lacking spines dorsally on tibia I, a different number of setae on telofemur, genu, and tibia II, basifemur, genu, and tibia III and tibia IV, and in the different structure of the epicuticle on the AE (Figs 4H, 15I).

Halacarus tritoni sp. nov.
(Figs 19A-D, 20)

ETYMOLOGY. *Triton*, Latin, Greek, a sea-god.

MATERIAL. HOLOTYPE: QMS105639, ♀, GBR Marine Park, 19°20.12'S 149°02.85'E, Elizabeth Reef, 25 Dec. 1997, epiflora on staghorn coral at 10m.

DESCRIPTION. *Female.* Idiosoma 452μm long. Dorsal setae in relation to the idiosoma longer than in preceding species (Fig. 19A). PD absent. AD poorly defined, developed anteriorly into distinct spine; covered by finely reticulate epicuticle similar to that shown for AE in Fig. 19C; ds-1 slightly anterior to glp-1; posterior part of AD with conspicuous muscle scars. OC absent but conspicuous oval cornea anterolateral to pore canaliculus. Seta ds-3 at same level as glp-3. Seta ds-5 widely separated from glp-4. Margins of ventral plates poorly defined; posterior margin of AE lined by a row of muscle scars. One pair of ventral setae in membranous cuticle. GO with 2 pairs of pgs, and 5 pairs sgs. Four pairs of eugenital setae protruding through GO (not illustrated).

Rostrum longer than gnathosomal base and both pairs of maxillary setae separated by an interval greater than that between proximal maxillary seta and proximal margin of gnathosomal base (Fig. 19D). Segment P-2 with both setae in distal half. Spine on P-3 with distinctly convex margins.

Leg chaetotaxy: (trochanter - tibia): I 1-2-10-10-13 (Fig. 20A), II 1-3-8-10-12 (Fig. 20B), III 2-2-7-9-11 (Fig. 20C), IV 1/2-2-5-7-10 (Fig. 20D); all basifemora with blunt dorsal spine. Leg I with 2 tapering spines ventrally on each of telofemur and genu, and 4 similar spines ventrally on tibia. Thickened setae also on genu and tibia II and to lesser extent on genua and tibiae III, IV. Tibia II with 2 bipectinate ventromedial setae, the distal one longer than the proximal one, and with 7-8 spines on either side. Tarsus I with 3 dorsal setae, 2 pairs of ventral setae and pair of doubled pas. Tarsus II with 4 dorsal setae, 3 pairs of ventral setae (the distal pair eupathidia) and pair of doubled pas. Tarsus III with 4 dorsal setae, 2 pairs of ventral setae, a doubled pas in which one branch is shorter than the other, and a pas singlet. Tarsus IV with 3 dorsal setae and pair of pas singlets, one leg with 2 pairs of ventral setae, the other with 3 ventral setae. Paired claws of all legs with accessory process consisting of 4-5 spines (Fig. 20E); no pecten along shaft.

REMARKS. *H. tritoni* belongs to the *actenos* group (Bartsch, 1993a) and is most similar to *H. socius* Bartsch, 1992, from the Society Islands. Both species share a similarly shaped AD with ds-1 slightly anterior to glp-1, 2 bipectinate setae on tibia II and the lack of such a seta on genu II. *H. socius* differs from *H. tritoni* by having 6 setae on telofemur III, 4 setae on telofemur IV, 5 setae on genu IV, a row of 3-4 spines on either side on the distal bipectinate seta on tibia II, straight instead

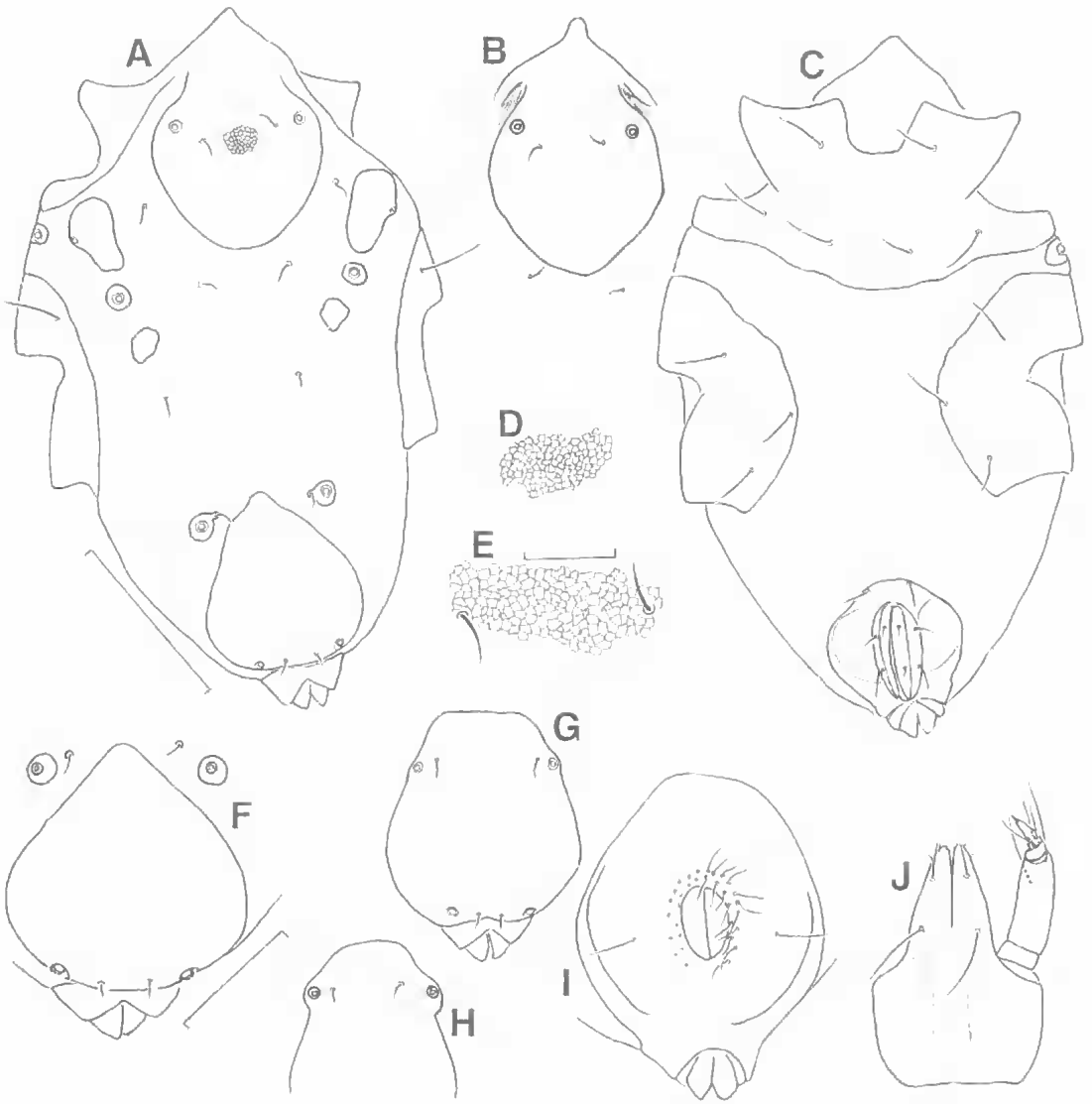

FIG. 17. *Halacarus striolus* sp. nov., adult. A, ♀, idiosoma, dorsal view; B, anterior dorsal plate; C, ♀, idiosoma, ventral view; D, detail of epicuticle of anterior epimeral plate; E, detail of epicuticle on anterior dorsal plate between ds-1; F, X, posterior dorsal plate; G, H, posterior dorsal plates of two ♂♂ (anterior part only in Fig. 17G); I, ♂, genitoanal plate; J, ♂, gnathosoma, ventral view. Scale bars: A (B,C,G,H) = 100μm; E (D) = 20μm; F (I,J) = 50μm.

of convex margins of the spine on palp segment P-3, and by having setae ds-3 inserted distinctly posterior to pores glp-3.

For *H. socius* Bartsch (1992) reported 9 setae on telofemur I and illustrated both bipectinate setae on tibia II as of equal length and thickness, which would distinguish it further from *H. tritoni*. However, I examined the holotype of *H. socius* and found 10 setae (or alveoli) on each telofemur I and the distal bipectinate seta on tibia II to be distinctly longer and heavier than the proximal one, similar to *H. tritoni* (Fig. 17B).

Halacarus tritoni is similar to *H. magniporus* Krantz, 1973 (see also MacQuitty, 1984) in the shape of the spine on P-2, but differs by having setae ds-5 clearly separated from glp-4 and lacking a bipectinate seta on genu II.

Other species of the *actenos* group similar to *H. tritoni* are *actenos* Trouessart, 1889 (Bartsch, 1979), *higginsi* Newell, 1984, and *zealandicus*

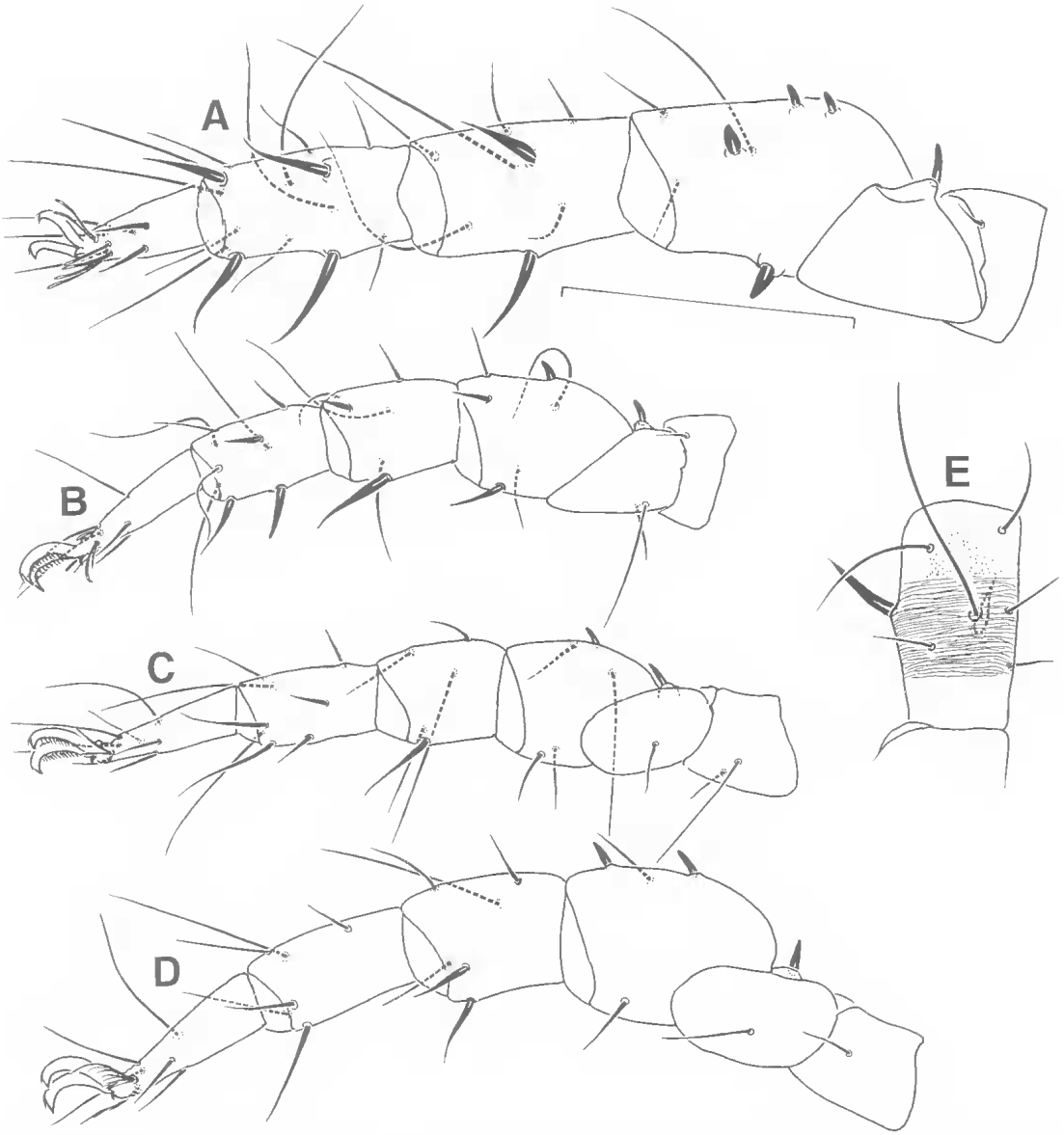

FIG. 18. *Halacarus striolus* sp. nov., adult. A, ♀, leg I, ventromedial view; B, ♂, leg II, ventromedial view; C, ♂, leg III, ventromedial view; D, ♂, leg IV, ventromedial view; E, ♂, tibia I, dorsolateral view. Scale bars: A (B-E) = 100μm.

Newell, 1984. *H. tritoni* differs from all of them by the spine on P-2 having distinctly concave margins. It differs from *H. higginsi* in the number of setae on telofemora I-IV (11-9-6-4 in *H. higginsi* respectively), from *H. zealandicus* by a shorter frontal spine, and from *H. actenos* in having five instead of 4 setae on telofemur IV (Bartsch, 1979), and lacking a bipectinate seta on genu II.

H. tritoni has 4 dorsal setae on tarsus III, which is unusual for species of the actenos group and *Halacarus* in general. It is unknown whether this represents an anomaly of the holotype or a distinguishing character of *H. tritoni.*

I have examined a ♀ (QMS105669, GBR Marine Park, 18°42.11'S 146°31.51'E, Fantome Island, 15 Apr. 1998, chunks of coral rubble at 2m) (Fig. 19E) which agrees in most aspects with

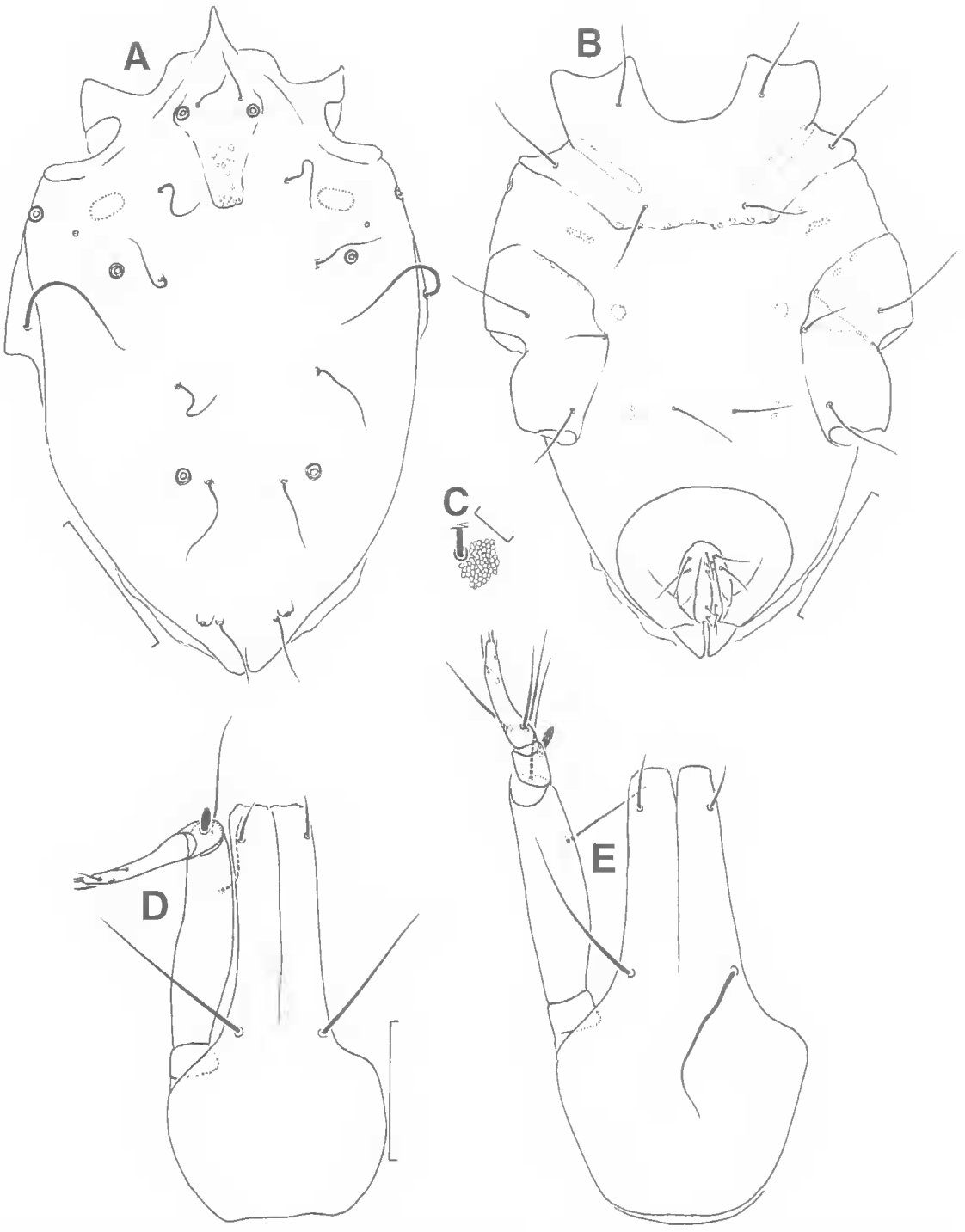

FIG. 19. *Halacarus tritoni* sp. nov., ♀. A, idiosoma, dorsal view; B, idiosoma, ventral view; C, detail of epicuticle on anterior epimeral plate near anterior pair of setae; D, ventral gnathosoma; E, *Halacarus* sp. ♀, (QMS105669), ventral gnathosoma. Scale bars: A, B = 100μm; C = 10μm; D (E) = 50μm.

FIG. 20. *Halacarus tritoni* sp. nov., ♀. A, leg I, ventromedial view; B, leg II, ventromedial view; C, leg III, ventrolateral view; D, leg IV, lateral view; E, apical part of paired claw II. Scale bars: A (B,C,D) = 100μm; E = 20μm.

the holotype of *H. tritoni*, but differs in several characters: The specimen is 603μm long, has 3 dorsal and 5 ventral setae on tarsus II, and has, in relation to its gnathosoma, a shorter rostrum with the 2 pairs of maxillary setae inserted closer together (Fig. 16F). It is unknown whether this specimen belongs to *H. tritoni* or to a further species in the *actenos* group.

KEY TO AUSTRALIAN SPECIES OF *HALACARELLUS*

1. Dorsal plates with reticulate or foveate ornamentation; OC ca. 2-2.5 × longer than wide 2

   Dorsal plates smooth apart from series of minute pits; OC more than 3 times longer than wide (Fig. 1A) . . . . . *H. katewilsonae* sp. nov.

2. Telofemur IV shorter than 1.3 × the length of genu IV . . . . . *H. rottnestensis* Bartsch, 1999

   Telofemur IV longer than 1.5 × the length of genu IV . . . . . *H. lubricus* Bartsch, 1985

KEY TO AUSTRALIAN SPECIES OF *HALACARUS*

Halacarus oblongus Lohmann is excluded as it is insufficiently described and I have been unable to locate the type material; *Halacarus* sp. A and sp. B (Bartsch, 1993a) are excluded as they are only known from juveniles.

1. Idiosoma without PD (Fig. 19A); if platelets are present in the posterior half of dorsum, then only in male, and only as a pair between ds-5 and ds-6 (Fig. 6A) 2

   Idiosoma with PD (Fig. 3A, 7A, 12A) 6

2. AD anteriorly obtuse; tibia II without pectinate setae . . . . . *H. celatus* Bartsch, 1993a

   AD anteriorly developed into conspicuous spine (Fig. 19A); at least one seta on tibia II pectinate (Fig. 20B) . . 3

3. Pore glp-4 and seta ds-5 closely associated on the same sclerite (Fig. 6A); spinose seta on tibia I pectinate only on one side (Fig. 6B); male with pair of platelets between setae ds-5 and ds-6 (Fig. 6A) . . . . . *H. discophorus* Bartsch, 1993a

   Pore glp-4 and seta ds-5 clearly separated (Fig. 19A) and not on the same sclerite; spinose seta on tibia I pectinate on two sides (Fig. 20B); male without pair of platelets between ds-5 and ds-6 4

4. Setae ds-1 inserted slightly anterior to pores glp-1 (Fig. 19A); genu II without pectinate seta (Fig. 20B); tarsi III and IV with at least 3 ventral setae, excluding pas (Fig. 20C,D) . . . . . *H. tritoni* sp. nov.

   Setae ds-1 inserted distinctly posterior to glp-1; genu II with pectinate seta; tarsi III and IV with one ventral seta (excluding pas) 5

5. Pores glp-1 on AD; both setae on P-2 separated by an interval greater than the width of P-2; telofemur III with 6-7 setae . . . . . *H. fuscatus* Bartsch, 1993a

   Pores glp-1 lateral to PD in membranous cuticle; both setae on P-2 separated by an interval less than the width

of P-2; telofemur III with five setae . . . . . *H. flavellus* Bartsch, 1993a

6. OC present, posterior to it a platelet (Figs 3A, 7A); telofemur I with 4 spines (Fig. 5A, 9A) 7

OC absent or present; if present then posterior to it without platelet; telofemur I with two spines 11

7. Pores glp-3 on OC (Fig. 7A, 8A-D). 8

Pores glp-3 separated from OC (Fig. 3A, 17A) 10

8. Tibia III with eight setae; cells' forming the epicuticular pattern on AE of similar length and width (Fig. 17D) . . . . . *H. sabulonis* sp. nov.

Tibia III with seven setae; cells' that form the epicuticular pattern on AE slender (as for AD in Fig. 7B; Fig. 10G) . 9

9. PD covered entirely by reticulate epicuticle; epicuticular structure on AE (Fig. 10G) with pattern conspicuously finer than on AD; lateral margins of female AD towards anterior at first converging but then expanding into unsymmetrical protrusion (Fig. 10A,E); known only from the Great Barrier Reef . . . . . *H. juliani* sp. nov.

PD only anteriorly and laterally with reticulate epicuticle (Fig. 7E); epicuticular structure on AE similar to that on AD (7B); female PD continuously narrowing anteriorly (Fig. 8E), known only from the Queensland Plateau . . . . . *H. heraldensis* sp. nov.

10. Tibia I dorsally with 3-5 spines or thickened setae (Fig. 5D); eight setae on genu II, ten setae on tibia IV . . . . . *H. chilcottensis* sp. nov.

Tibia I dorsally without spines (Fig. 14A); six setae on genu II; six setae on tibia IV . . . . . *H. striolus* sp. nov.

11. Rostrum shorter than gnathosomal base; OC absent . 12

Rostrum longer than gnathosomal base; OC well developed 14

12. Seta ds-5 and pore glp-4 inserted together on one sclerite 13

Seta ds-5 near but not on same sclerite as pore glp-4 . . . . . *H. arenarius* Bartsch, 1993a

13. Seta ds-1 anterior to glp-1; AD slender, not markedly expanded at level of glp-1 . *H. parvulus* Bartsch, 1993a

Seta ds-1 posterior to glp-1; AD expanded at level of glp-1 . . . . . *H. helenae* Bartsch, 1993a

14. Dorsal plates and legs conspicuously striated (Fig. 13A-C, 14A); setae in dorsal membranous cuticle shorter than OC (Fig. 13A). 15

Dorsal plates covered by delicate cuticular droplets; setae in dorsal membranous cuticle longer than OC . . . . . *H. psammophilus* Bartsch, 1993a

15. Pore canaliculus on the OC slightly posterior to glp-3; both ventral spines on telofemur I inserted close to the distal margin of the segment; anterior margin of female PD closer to ds-4 than to ds-5 . . . . . *H. mitrellus* Bartsch, 1993a

Pore canaliculus on the OC distinctly anterior to glp-3; one of the two ventral spines on telofemur I in proximal half; anterior margin of female PD much closer to ds-5 than to ds-4 . . . . . *H. rarus* sp. nov.

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